

Organic Chemistry I Lab (CHGN 223)

Fall 2026

LAB COURSE DETAILS

Location

Coolbaugh Hall (CO), Lab 324 - walk past Lab 320 and the two chemical cabinets, turn right down the hallway, and it's the last door on the right.

Course Material

- 1) Organic Chemistry I Lab Manual by Cengage Learning
- 2) Mines Handouts (provided prior to the lab date)

Notebook

A lab notebook with carbonless duplicate pages is required. The copies (bottom pages) are turned in to the TA for grading. The original pages are for your records, as verification that you attended lab and did the work. In addition, you retain your notebook to prepare for the next lab.

Instructors

POSITION	NAME	OFFICE	EMAIL
Lab Coordinating Professor	Dr. Yuan Yang	CO 121	yuanyang@mines.edu
Lab Instructors	Dr. Michael McGuirk	CO 160	cmmcguirk@mines.edu
	Dr. Dylan Domaille	GRL 341	ddomaille@mines.edu
	Dr. Alan Sellinger	CO 156	aselli@mines.edu
	Dr. Yuan Yang	CO 121	yuanyang@mines.edu
Teaching Assistants	Luke Tkaczyk	Office hours	ltkaczyk@mines.edu
	Morgan Fandrey	and location	morgan_fandrey@mines.edu
	Silas Cascio	will be provided	silas_cascio@mines.edu
	Zach Thompson	by the TA.	zethompson@mines.edu
Lab Manager	Ramona Figueroa	CO 311	rfiguero@mines.edu

Lab Schedule

DAY	SECTION	TIME	TA	INSTRUCTOR
Tuesday	A	8:00 am	Zach Thompson	Dr. Yuan Yang
	B	11:00 am	Silas Cascio	Dr. Alan Sellinger
	C	2:00 pm	Silas Cascio	Dr. Dylan Domaille
Wednesday	D	11:00 am	Luke Tkaczyk	Dr. Yuan Yang
Thursday	F	8:00 am	Zach Thompson	Dr. Michael McGuirk
	G	11:00 am	Luke Tkaczyk	Dr. Yuan Yang
	H	2:00 pm	Morgan Fandrey	Dr. Yuan Yang

WEEKLY ACTIVITY (SUBJECT TO CHANGE)

DATE	EXPERIMENT
September 1, 2, 3	CHECKIN: <i>Introductions, Lab Policies, Drawer and Equipment Assignments, and Expectations</i> TECH 700: <i>Practicing Safety in the Organic Chemistry Laboratory Safety Contract and Quiz, page 1</i>
September 8, 9, 10	TECH 701: <i>Measuring the Melting Points of Compounds & Mixtures, page 29</i>
September 15, 16, 17	TECH 703: <i>Purifying Acetanilide by Recrystallization, page 43</i>
September 22, 23, 24	TECH 704: <i>Separating Cyclohexane and Toluene by Distillation, page 57</i> Macroscale Distillation, Part 1. Simple ONLY, page 63
September 29, 30 October 1	TECH 705: <i>Separating Acids and Neutral Compounds by Solvent Extraction, page 81</i> Microscale Extraction, page 86
October 6, 7, 8	HANDOUT: <i>Separation of Spinach Pigments by Column Chromatography</i>
October 13	FALL BREAK: <i>No Labs on Tuesday / Labs resume on Wednesday and Thursday</i>
October 14, 15, 20	HANDOUT: <i>Greener Bromination of Stilbene Greener Chemistry, in situ Br₂, Better Atom Economy</i>
October 21, 22, 27	HANDOUT: <i>Conformation of Alkylcyclohexanes (Stereochemistry)</i> ADF (AMS) Computational Exercise
October 28, 29 November 3	REAC 714: <i>Studying S_N1 and S_N2 Reactions: Nucleophilic Substitution at Saturated Carbon, page 115</i> Factors Affecting the Rates of S _N 1 Reactions, page 125
November 4, 5, 10	HANDOUT: <i>COMPETITION BETWEEN S_N2 AND E2</i>
November 11, 12, 17	HANDOUT: <i>Gas Chromatography</i>
November 18, 19, 24	REAC 712: <i>Dehydrating Cyclohexanol, page 133</i> Microscale Dehydration Using a Hickman Still Assembly, page 141
December 1, 2, 3	HANDOUT: <i>Spectroscopy - Using FTIR, MS & NMR to Determine the Identity of an Unknown Compound</i>

LAB NOTEBOOK REQUIREMENTS

All experimental procedures, notes and data are to be kept in a bound notebook. The following guidelines are to be followed in order to keep an accurate laboratory record. **Someone should be able to duplicate your experimental work and results by reproducing the written information in your notebook.**

1. Number all pages in your laboratory notebook using permanent ink.
2. Reserve a couple of pages in the beginning of the notebook for a table of contents.
3. Make all entries in your lab notebooks in permanent ink (i.e. not water soluble).
4. Write in third person, past tense as an objective observer.
5. Do not remove any pages from your notebook.
6. Draw only one line through entry errors, and write the correct information directly below.
7. Place a single diagonal line through any blank space in your notebook.
8. **Prior to lab:** Read all assigned material. Complete the **pre-lab assignment** and turn it in to the TA at the beginning of lab. Enter the experimental objective and SDS into your lab book to be checked by the TA before lab. Points will be deducted if these entries are incomplete. A mechanism is required only for a chemical synthesis. **If the pre-lab assignment is not complete upon arrival to lab, you will not be allowed to do the experiment.**
9. **During lab:** Enter your experimental procedures (including alterations, spills, accidents, restarts, etc.), observations, data, weight of product, % yield of product, melting point range or boiling point range, product color, etc. in your notebook **as you do the experiment**, not before you come to lab or at a later time. Do not tape or paste anything into the notebook. Any spectra obtained from instrumental analysis should be attached to your report.
10. Sign and date your notebook at the end of each lab period.
11. **OBTAIN YOUR TA'S OR INSTRUCTOR'S SIGNATURE IN YOUR NOTEBOOK AT THE END OF EACH LAB PERIOD.** This provides verification that you actually attended and completed the lab. If there is no TA or Instructor signature, you will receive a zero for that lab.
12. **Cheating in any form is not tolerated.** All laboratory work and notebooks are to be done on an individual basis. Copying or using another student's work will result in a **FAILING GRADE** for the course and for all students involved.

LAB NOTEBOOK REQUIREMENTS *continued*

It is important that you know the potential hazards associated with the compounds you are using and how to handle them safely. The labs are designed to avoid use of toxic or carcinogenic compounds, but you should be aware of the hazards ahead of time.

Table 1: Example of a Table of Properties

Compound	MW (g/mol)	Amt. Used	mmol	bp(°C) liquids	mp(°C) solids	d (g/cm ³)	SDS		
							Section 7 Handling	Section 8 Protection	Section 9 Properties color/state
2-Bromobutane	137.0	100 μ L	0.92	91.2	-	1.26	VE	GG, GL	
Benzaldehyde	106.1	200 μ L	1.96	178	-	1.04	VE	GG, GL	
Phosgene	98.9	10 μ L	0.14	8	-	1.43	FH	GG, GL	
Adipic acid	146.1	500 mg	3.4	-	153	1.35	VE	GG, GL	
Benzene							FH	GG, GL	
Toluene							VE	GG, GL	
Ethanol							VE	GG, GL	
Nitric Acid							VE	GG, GL	
Ethyl ether							VE	GG, GL	

Use acronyms in your table for the SDS information. You do not need to write the definitions in your lab book. Specifically, look for the SDS properties of the chemicals you'll use for the upcoming lab.

Handling: FH = Use in fume hood, VE = Use in ventilated area (on lab bench)

Protection: GG = Goggles, GL = Gloves

LAB GRADING

Pre-lab Report (Assigned Questions)..... 5 points

Lab Notebook (Recommended Organization)

Objective..... 2 points

Chemical Properties Table (MSDS)..... 3 points

Mechanism for a synthesis reaction..... 5 points

Procedure..... 5 points

Results & Observations..... 15 points

Conclusion..... 10 points

Post-lab Report (Assigned Questions) 5 points

Total 50 points

Tardies, Absences, ... 0 points

Incomplete Reports, No Report Submitted,

No TA Signature in notebook to verify lab completion

GENERAL LAB POLICIES

Lab Attendance

YOU MUST BE ON TIME FOR EACH LAB SESSION. If you come later than the start of the lab, **you will NOT be admitted into the lab**, and you will receive a zero grade for that lab. Continued tardiness will result in a failing grade.

Pre-Lab Assignments

You must have your pre-lab assignment completed and turned in to the TA at the beginning of your assigned lab period. The completion of the pre-lab assignment is our evidence that you have read the lab assignment before coming to lab and are prepared to do the experiment. **If the pre-lab assignment has not been completed, you will not be allowed to perform the experiment and you will receive a zero grade for that lab.**

Lab Make-Up

No make-up labs are offered. As further clarification, you will not be allowed to join another section to perform that week's experiment. All labs will count toward the final grade. Excused absences will be handled by determining the grade on only completed experiments; however, there is a maximum of three excused absences for the course. If you have more than three excused absences, you will be advised to withdraw from the course or receive the subsequent and appropriate grade, including failure of the course.

Lab Reports

Lab reports must be turned in at the beginning of the lab period the following week, or when necessary, on the date requested by the TA. Lab grades will be deducted by 5 points for the first day it is late and 3 points for each day thereafter. **If no report is turned in to the TA by the fifth late day, a zero grade will be given for that lab.**

Lab Cleanliness

An important aspect of working in a lab is to **be considerate of others** working in that same space. Students are required to clean any and all work area(s) and equipment used, including lab benches, fume hoods, hotplates, balances, melting point apparatus, refractive index apparatus, gas chromatographs, infrared spectrometers, etc. Points will be deducted from that day's report if you fail to clean up after yourself. Please take care of the following items before you leave the lab.

1. **Never leave a chemical spill** at your work space, balance, or at any other equipment or instrumentation in the lab. **CLEAN IT UP IMMEDIATELY!! ASK if you are unsure of the procedure.**
2. To clean the bench top, spray DI water (from the wash bottle) over your work area and wipe with paper towels to remove any chemical residue. Dispose of paper towels in the solid waste container in the waste hood.
3. Return all of your lab glassware/supplies to your assigned drawer and lock it.

Label All Containers

All containers containing chemicals must be labeled. Use the provided Sharpie marker to write on the clear part of the glass. Do not write on the white (or frosted) area because it is difficult to clean. The Sharpie markings are easily removed with methanol sprayed over the liquid container in the waste hood.

References

Site for Obtaining FTIR and NMR Literature Spectra

http://sdbs.db.aist.go.jp/sdbs/cgi-bin/cre_index.cgi

Important Sites for Obtaining SDS Information

<http://www.ilpi.com/msds/>

<http://www.ilpi.com/msds/ref/chip.html>



Physical-Chemical Properties ¹		
Code Letter(s) & Meaning	Danger Symbol	Description
E Explosive		Solid, liquid, pasty or gelatinous substances and preparations which may react exothermically without atmospheric oxygen thereby quickly evolving gases, and which under defined test conditions detonate, quickly deflagrate or upon heating explode when partially confined.
F+ Extremely Flammable		Liquid substances and preparations having an extremely low flash point and a low boiling point and gaseous substances and preparations which are flammable in contact with air at ambient temperature and pressure .
F Highly Flammable		Substances and preparations which may become hot and finally catch fire in contact with air at ambient temperature without any application of energy, Solid substances and preparations which may readily catch fire after brief contact with a source of ignition and which continue to burn or to be consumed after removal of the source of ignition, Liquid substances and preparations having a very low flash point , or Substances and preparations which, in contact with water or damp air , evolve extremely flammable gases in dangerous quantities.
(none) Flammable	(no symbol)	Liquid substances and preparations having a low flash point .
O Oxidizing		Substances and preparations which give rise to a highly exothermic reaction in contact with other substances, particularly flammable substances.

Note: Some of the letters/symbols used in these tables are also used as [TSCA](#), [HMIS](#) and/or [DoD HMIRS](#) codes, all of which have completely different meanings and applications! See why we dislike code systems?

Health Effects ¹		
Note: Some symbols appear more than once in the following table. Please study the first column carefully.		
Code Letter(s) & Meaning	Danger Symbol	Description
C Corrosive		Substances and preparations which may, on contact with living tissues, destroy them.
N Dangerous For The Environment		Substances and preparations which, were they to enter into the environment, would present or might present an immediate or delayed danger for one or more components of the environment. Does not apply to preparations. In certain cases, some substances do not need to be labelled with the danger symbol for this category.



T+ <u>Very toxic</u>		Substances and preparations which in very <u>low quantities</u> cause death or <u>acute</u> or <u>chronic</u> damage to health when <u>inhaled</u> , <u>swallowed</u> or <u>absorbed via the skin</u> .
T <u>Toxic</u>		Substances and preparations which in <u>low quantities</u> cause death or <u>acute</u> or <u>chronic</u> damage to health when <u>inhaled</u> , <u>swallowed</u> or <u>absorbed via the skin</u> .
Xi <u>Irritant</u>		Non- <u>corrosive</u> substances and preparations which, through immediate, prolonged or repeated contact with the skin or mucous membrane, may cause <u>inflammation</u> .
Xn <u>Harmful</u>		Substances and preparations which may cause death or <u>acute</u> or <u>chronic</u> damage to health when <u>inhaled</u> , <u>swallowed</u> or <u>absorbed via the skin</u> .
<u>Sensitizing</u> Xn Sensitizing by <u>inhalation</u> Xi Sensitizing by <u>skin contact</u>	 (i.e. Xn or Xi)	Substances and preparations which, if they are <u>inhaled</u> or if they <u>penetrate the skin</u> , are capable of eliciting a reaction by <u>hypersensitization</u> such that on further exposure to the substance or preparation, characteristic adverse effects are produced.
<u>Carcinogenic</u> T - Category 1 ¹ T - Category 2 Xn - Category 3	(depends on category)	Substances and preparations which, if they are <u>inhaled</u> or <u>ingested</u> or if they <u>penetrate the skin</u> , may induce <u>cancer</u> or increase its incidence
<u>Mutagenic</u> T - Category 1 ¹ T - Category 2 Xn - Category 3	(depends on category)	Substances and preparations which, if they are <u>inhaled</u> or <u>ingested</u> or if they <u>penetrate the skin</u> , may induce <u>inheritable genetic defects</u> or increase their incidence.
<u>Toxic for reproduction</u> T - Category 1 ¹ T - Category 2 Xn - Category 3	(depends on category)	Substances and preparations which, if they are <u>inhaled</u> or <u>ingested</u> or if they <u>penetrate the skin</u> , may produce or increase the incidence of <u>non-inheritable adverse effects in the progeny</u> and/or of male or female <u>reproductive functions or capacity</u> .

¹ See [CHIP4 Schedule 1](#)