

## CHEMISTRY 2123 (Organic Chemistry Lab I), Spring 2023

**\*\*Disclaimer:** The Instructor of Record has the authority to alter this syllabus in the case of weather events, university power outages, pandemics, or any other event that requires the university to close.\*\*

**Lab Coordinator:** Dr. Mary Bean, 318 STL, [mbean3@uh.edu](mailto:mbean3@uh.edu)

If your TA cannot satisfactorily resolve an issue, contact the Lab Coordinator as soon as possible. The end of the semester, especially after grades are submitted, is not the best time to report problems. (Example: If the TA is not returning the graded lab reports in a timely manner, let the Lab Coordinator know asap.)

There are 32-36 sections of organic lab every semester. Always include the course number (2123), the 5-digit class number, and your TA's name in any email to the lab coordinator.

*Students requiring assistance under the Americans with Disabilities Act guidelines must discuss arrangements with me within the first two weeks of class.*

**Your TA's name:** \_\_\_\_\_ **Office:** \_\_\_\_\_ **Office hours:** \_\_\_\_\_

Your TA is the first point of contact for your questions pertaining to lab except for make-up lab requests (see Make-Up Policy).

### For the laboratory you will need the following items:

1. **The textbook:** "Organic Lab Manual, Custom 2<sup>nd</sup> Edition – University of Houston" ISBN-13: 9781337453042, This is a custom manual published by Cengage Learning. It is available only at the UH Bookstore.
2. **A laboratory notebook** that is permanently bound, has serially numbered pages, and that allows you to make a removable carbon copy which can be turned in for grading.
3. **A laboratory coat** that is long-sleeved and knee length. The coat must be completely buttoned during lab.
4. **Sturdy, closed-toed shoes that cover the entire foot.** Sandals or shoes that leave a large area of the foot exposed are NOT allowed.
5. **Safety goggles (NOT SAFETY GLASSES).** The laboratory coat and goggles must be worn in the laboratory at all times anyone in the laboratory is doing experimental work.
6. **Long pants or other garment that completely covers the legs.** Shorts or short skirts/dresses are NOT allowed in the lab. Suggestion: Keep a pair of loose scrub pants that may be worn over shorts or under skirts in your backpack.
7. **A STRONG, RELIABLE lock** for your laboratory drawer. This lock must be placed on your drawer at the end of check-in on the first day of lab. You are responsible for any broken, missing, or stolen glassware and equipment at the end of check-in. Lock your drawer whenever you leave your bench, even if only walking across the room. Lock your drawer at the end of every lab period. **Never** leave the combination on the back of a combination lock.

### Lab Safety:

The Department of Chemistry takes safety seriously. All safety measures described on page 1 of the lab manual and in the safety video are important. Keeping your goggles over your eyes at all times anyone in the laboratory is doing experimental work is required and may save your eyesight. These times include while you are writing in your lab notebook, using the melting point

apparatus or balance, cleaning up at the end of lab, taking an IR spectrum, and talking to your TA at the TA bench.

If you receive excessive goggle warnings, the TA or the lab coordinator will ask you to leave the lab, and you will receive a zero for the lab report for that period.

### **Grading Policies:**

**Lab Reports:** 60% of the grade

A copy of the Lab Report Format with details is included later in the syllabus. There are eleven lab reports for the semester. The Pre-lab (sections I-V) is due at the beginning of each lab period. The Experimental Procedure/Observations/Data section (Section VI) is due at the end of the lab period. The Post-lab report (after-lab sections, sections VII-X) is due at 11:59 PM TWO DAYS after the lab is **completed**. (Example: Monday labs are due on Wednesday.) Completion of a lab means that all data has been collected. Data includes melting points, masses, and TLC.

One lab report is automatically dropped for each student.

#### **Each lab report will be graded on the following basis:**

Laboratory report write-up: ~ 50% (This is the "effort" portion of the grade.)

Yield, purity, identification of unknowns, etc.: ~ 50% (This is the "results" portion of the grade.)

**Note:** All products generated must be turned in to the TA to receive credit for the lab.

**Quizzes:** 20% of grade. There are four quizzes. None are dropped. The quizzes may be pop quizzes. The quizzes may cover the experiment of the day or the experiment of the previous week.

**Final Exam:** 20% of grade

#### **Letter grade definitions:**

- A = superior performance
- B = very good performance
- C = average performance
- D = poor performance
- F = failing

Please notice that the grade definitions are couched in terms of performance achieved not effort expended. The letter grades are determined by the lab coordinator and are determined by comparing the average in a given section to the overall average of all of the sections. If a TA's stricter than average grading results in a lower class average, that section will receive a curve to compensate for the difference. If a TA's lenient grading results in a much higher class average, that section will receive a curve to compensate for the difference. The latter case occurs infrequently and is used in extreme cases. (For example, a grade distribution in which 80% of students receive A/A- and 20% of students receive B+/B/B- is not possible, reasonable, or fair to students in other sections.)

The starting point for any curve is the standard grade scale given below:

A=93-100, A- =90-92, B+ =87-89, B=83-86, B- =80-82, C+=77-79, C=73-76, C- =70-72, D+=67-69, D=63-66, D- =60-62, F=59 and below

### **Academic Honesty Policy:**

The organic chemistry laboratory is a class just like any other class. As a result, you are expected to do your own work. **There are no lab partners in the organic chemistry laboratory, and all**

**work is to be done individually.** This includes, but is not limited to, the writing up of your lab reports. You are not allowed to work with others on your lab reports.

Additionally, the melting points and yields of your products may be checked by your lab instructor. The penalty for falsifying laboratory results or engaging in any kind of academic dishonesty may be the award of a grade of "F" for the laboratory course. Any questions or comments regarding this matter should be directed to Dr. Bean.

**Reminder:** Plagiarism is **CHEATING**. Copying directly from any source (the lab manual, a website, another student, an old lab report) is not allowed.

### **Make-Up Policy:**

**Missed Lab:** A make-up lab is not guaranteed and is possible only if space allows and the excuse is for a reasonable, **nonacademic** issue. Make-up labs must be done in the week the lab is missed. Make-up labs are arranged by email with the lab coordinator (Dr. Bean), not with the TA. In the email request, include the course number (2123), the 5-digit class number, and your TA's name. Copy the email to your TA.

If a make-up lab is not possible, and the absence is due to a reason listed in the official UH Excused Absence Policy, it will be excused. The missed lab report grade will be replaced with the average of your lab reports. To receive an excused absence, the absence and excuse must be immediately reported by email to the lab coordinator (Dr. Bean) and **documentation must be provided**. Please copy the TA. In the email request, include the course number (2123 or 2125), the 5-digit class number, and your TA's name.

**Missed Quiz:** A make-up quiz will be given at the end of the semester. The make-up quiz will only replace a quiz missed with a reasonable excuse. **It cannot be used to replace a lower quiz grade.**

### **UH CAPS Statement:**

Counseling and Psychological Services (CAPS) can help students who are having difficulties managing stress, adjusting to college, or feeling sad and hopeless. You can reach CAPS ([www.uh.edu/caps](http://www.uh.edu/caps)) by calling 713-743-5454 during and after business hours for routine appointments or if you or someone you know is in crisis. No appointment is necessary for the "Let's Talk" program, a drop-in consultation service at convenient locations and hours around campus. [http://www.uh.edu/caps/outreach/lets\\_talk.html](http://www.uh.edu/caps/outreach/lets_talk.html)

### **Lock Policy:**

If you did not have your own lock on lab check-in day, remember to bring it to the next lab. The TA will unlock the department lock on the second lab day, but only if you have your own lock. Without your own lock, you will not be able to participate in lab.

Forgetting your lock's combination or key is not an excuse for a make-up lab. The TA can cut off your lock, so that you can participate in lab.

### **Policy on Broken or Missing Equipment:**

#### ***Important! Read this!***

At lab check-in, you will be instructed to verify whether any of the equipment in your assigned drawer is broken or missing. It is important that you carefully check the contents of your drawer

and report any discrepancies to your TA. After the initial check-in, if you break or lose equipment from your drawer during the semester, you must purchase replacements at the University Research Stores in the basement of the Fleming Building, Room 70. **Because of the importance of quality control, you may not purchase glassware or equipment from any other source such as amazon.com. You will be charged the full stockroom price if you substitute another brand.**

**IMPORTANT NOTE: The Research Stores only accepts credit (Discover, Mastercard, Visa, and Amex) and debit cards. It does NOT accept cash or Cougar cash.** If you break equipment or something turns up missing during your lab session, you will need to have a credit or debit card available to purchase a replacement. Equipment cannot be borrowed from Research Stores or your TA. If you cannot finish your lab because you cannot or will not purchase replacement equipment, you will need to ask your Lab Coordinator (Dr. Bean) for permission to come to a different lab to finish your experiment. It is completely at the Lab Coordinator's discretion whether you will be allowed to make up the lab under this circumstance. Bottom line: Avoid problems by making sure that you have a credit or debit card on your person when you come to lab.

At your last scheduled lab session of the semester, you will have the opportunity to check the contents of your drawer and purchase replacement items at the Research Stores as needed. If you do not complete your checkout for any reason (e.g., you drop the class, you do not show up for checkout, etc.) or you cannot or refuse to purchase replacements for broken or missing equipment, you will be charged the cost for replacements plus an additional \$10 service charge on your University fee bill.

***You are solely responsible for the equipment in your drawer. Use the equipment properly and keep track of the equipment when your drawer is unlocked to avoid having to replace costly equipment and possibly incur unnecessary fees. Lock your drawer whenever you step away from it even if only for a moment and especially at the end of the lab period.***

### **Care of Equipment/Lab Space/Reagents:**

Much of the equipment used in scientific laboratories is surprisingly expensive. Over the last four years more than two hundred thousand dollars has been invested in upgrading the equipment and laboratory facilities in the organic laboratories alone. It is obvious that the equipment recently added must be maintained in good condition for many years, since it cannot be replaced very often. If it is to have a satisfactory lifetime, you must cooperate by using it correctly.

Most importantly, the balances must not be abused by having chemicals spilled on them. To avoid doing so, place on the balance pan only a container which is clean and dry on the outside, and **NEVER ADD CHEMICALS TO THE CONTAINER WHILE IT IS ON THE BALANCE PAN**. First remove the container to the desktop nearby, add the chemicals, then return the container to the balance for reweighing.

Place no liquid wastes in the sinks except those approved for disposal down the drain. All others must be placed in the properly labeled waste bottles provided for them.

Place no solid wastes of any kind in the sinks or drain troughs. Boiling chips are particularly hard on drains. Keep them out of the sinks.

Reagent bottles must be capped at all times they are not actually being used. **You** must replace the cap on each bottle as soon as you have finished using it. Never uncap more than one bottle at a time. **Never** transfer solid material from the bottle to the inverted bottle cap. Use a weighing boat for that purpose. **Never** leave unlabeled materials in weighing boats, etc., on the benchtop.

**Never returned unused reagent to the original container, i.e., don't contaminate the source.**

If proper techniques are used, there is little occasion for chemicals to be spilled on the benchtops near the balances or on the hood surfaces. Any chemicals spilled should be cleaned off immediately by the person spilling them using a method appropriate to the substance spilled. Ask the TA for help.

### **The Laboratory Notebook:**

Section VI of the Laboratory Report Format (found below) is to be recorded in the laboratory notebook. The lab notebook is intended to be the record of what you do and observe in the laboratory. Although it should be written as legibly as possible, accuracy and completeness are its major goals, rather than neatness. All experimental procedures and observations should be made directly in the laboratory notebook **with ink**. It should be carried to the balance, and the weight measured recorded there. It should accompany you to the melting point apparatus, and so forth.

**SCRAPS OF PAPER WITH EXPERIMENTAL OBSERVATIONS JOTTED ON THEM ARE SUBJECT TO CONFISCATION.**

You are expected to secure your instructor's initials in your notebook at the beginning of each laboratory period, and at the end as well, so that it is obvious what you wrote during the period.

Corrections of the record must be made in such a way that the original observation remains legible. Simply draw one line through the item to be deleted and write in the corrected entry. Never erase, white out, or otherwise attempt to alter the original or the carbon copy. **Whenever corrections are made to data, you must obtain your TA's initials or signature beside the correction.**

The carbon copy is removed from the notebook and turned in to the TA at the end of the lab period. The original remains in the notebook. When writing, be sure to press hard enough that the carbon copy is legible. **If a page in the notebook is skipped within a report, draw an "X" across the page and hand it in with the report. The pages turned in must be sequential.**

All other sections of the lab report may be composed and typed outside of the lab. (See Laboratory Report Format below).

### **The Laboratory Report Format:**

Be sure to include your name, **your TA's name** and the 5-digit class # at the top of each page of the report. Always use language appropriate for a scientific paper. For example, statements in the Conclusions section such as "This lab was easy and really fun" or "This lab was really hard and took too much time" are not suitable or relevant. The format for the report is below.

#### **I. Title and Date**

This section simply gives the title of the experiment and the date it was (will be) performed.

#### **II. Answers to the Pre-Laboratory Exercises**

This section includes the answers to the assigned pre-laboratory questions.

#### **III. Purpose**

This section includes a brief explanation of why you are doing the experiment or what you hope to learn.

#### **IV. Reactions**

If the lab involves carrying out a chemical reaction, you must write the chemical equation by drawing the structures of the reactants and products. Screen shots of the reaction in the lab manual or from any other source may not be used. Omit this section, if no reactions are involved.

## V. Table of Physical Constants

This section is a **table** that lists all of the chemicals that will be used in the experiment, including any products formed, as well as physical data for each compound: molecular weight (g/mol), melting point (°C), boiling point (°C), density (g/ml), and **hazards**. This information can be obtained at various websites such as [www.sigmaaldrich.com](http://www.sigmaaldrich.com), [www.fishersci.com](http://www.fishersci.com), or [www.alfa.com](http://www.alfa.com). Click on the MSDS for each compound to find the physical data.

## VI. Experimental Procedure/Observations/Data (Must be written directly into the lab notebook **during** the lab period.)

- This section includes a detailed description of what you did while in the laboratory. Refer to the figure in the Lab Manual for any apparatus used. A sketch of the apparatus is not necessary.
- Use past tense when recording procedure. Example: 10g of X were added to the solution. Use passive voice. Example: The solution was stirred for 1 hour. Not: I stirred the solution for 1 hour.
- Be particular about reporting the actual amounts of materials used (not the amount given in the lab manual) and any modifications to the original procedure. Avoid simply copying the original procedure.
- Include any important observations made during each step such as color changes, precipitation, dissolving of solids, gas evolution, etc. At the end of this section, record any data collected such as melting ranges, weights, etc.

**This section is to be written in the lab in your lab notebook. You should record each step as you perform it. Don't wait until the end of the lab period to recall each step. Data and observations are to be recorded directly into the lab notebook at the time the data is collected or the observations are made.**

**Note:** TLC plates must be sketched to scale in the notebook and then turned in at the end of lab to the TA. GC chromatograms and IR and NMR spectra are considered data. **These must be turned in with the report.**

## VII. Calculations

This section includes calculations such as  $R_f$  values, theoretical yields, percent yields and percent recoveries. Any time a reaction is carried out, it will be necessary to calculate a theoretical and percent yield. If no calculations are needed for the experiment, this section is omitted.

## VIII. Results and Discussion

This section includes the results of the experiment as well as the interpretation of any observations made during the experiment. This is where the yield and melting point or boiling point should be discussed. Additionally, include whether the results of the experiment were as expected. If they were different from the expected results, give a reasonable explanation as to why.

## IX. Conclusion

This section includes an overall evaluation of the results. It should include statements indicating what was learned in the experiment. Additionally, include any modifications to procedure that might improve the outcome of the experiment.

## X. Answers to Post-Laboratory Questions

This section includes the answers to the assigned post-laboratory questions.

**Sections I-V** will be referred to as the Pre-Lab and must be completed **before** coming to lab. These sections may be typed and printed. These sections must be turned in **at the beginning** of each lab or no credit will be received.

**Section VI** is to be written **in the lab** as you are performing the experiment or reaction. It is not a procedure that is written down before you begin and then followed. It is to be written in ink in the lab notebook. Press firmly. The **carbon copy** must be turned in at the end of the lab period.

**Sections VII-X** will be referred to as the Post-Lab. These sections may be typed and printed outside of lab. The Post-Lab is due at 11:59 PM two days after completion of the lab. (Example: The reports of Monday sections are due on Wednesday at 11:59 PM.) Completion of the lab includes all data collection such as masses and melting ranges. If a sample is left to dry until the next lab period, or other parts are to be completed in the next lab period, the lab report will not be due. Submission of the Post-Lab to Blackboard is described below.

### **Turning in Post-Lab:**

Pdf's from scans or .jpg (.jpeg) or .png files from good quality photos of the Post-lab must be submitted to Blackboard. There are free apps available for cell phones that can be used. The Post-lab must be uploaded by 11:59 PM on the due date or it will be counted late. **ALWAYS check your email for confirmation that your report was successfully uploaded. This email is the proof that your report was submitted on time.**

If you have trouble with submission to Blackboard, you may email the pdf to your TA. It must arrive in your TA's inbox by 11:59 PM on the due date. Don't make this a habit. Figure out the problem by contacting UH IT.

### **Late Lab Report Policy:**

The penalty for a late lab report is 10 points per day. Under extreme, verifiable circumstances, the lab coordinator, not the TA, may adjust this penalty. Contact the lab coordinator.

### **Weekly Lab Schedule and Information:**

**NOTE:** Few lab manuals are perfect. Sometimes adjustments in procedure need to be made for the best results. Sometimes safer reagents are substituted for those in the lab manual. The syllabus describes most of these changes, but additional changes may sometimes be necessary. It is the responsibility of the student to make note of any such change when given by the TA.

The order in which the experiments are performed in the lab may not be the same as the order in the manual. Always refer to the syllabus each week.

**SPECIAL NOTE:** A link to the pre-lab video lectures is below. Watching the video before you come to lab will greatly enhance your understanding of the experiment and your efficiency in the lab. The videos are short and for safety reasons, will be shown at the beginning of each lab period.

<https://tinyurl.com/Chem3221Pre>

**EXTRA SPECIAL NOTE:** Arriving to lab on time is important. For safety reasons, if you are more than 15 minutes late, you may not perform the experiment. Ask the lab coordinator if a make-up lab is possible.

**Dates given in the schedule:** This syllabus is used for lab sections meeting throughout the week. For example, when lab work is designated for January 17-23, it does not mean that a student can choose any day in that week to do the work. Students in Tuesday sections will do the work on January 17. Students in Wednesday sections will do the work on January 18, etc. Students in Monday sections will do the work on January 23. Because the semester begins on a Tuesday, the "lab week" will be Tuesday- Monday, so Monday will always be the last day to perform an experiment or reaction.

Jan. 17-23 Orientation lecture, check-in. Wash glassware if necessary and watch film on Lab Safety.

Jan. 24-30 Thin-Layer Chromatography

**Remember to bring your lab coat, goggles, lab manual, and lab notebook. You will not be allowed to participate without the proper shoes, lab coat, covered legs, and goggles. If you did not bring a lock on the first day (check-in), you must have a lock by today. Your lock will not be unlocked unless you have a replacement lock of your own.**

**Remember to bring the completed pre-lab sections (sections I-V) to hand in (See below).**

Prelab preparation: Read **Thin-Layer Chromatography (TLC): Analyzing Analgesics and Isolating Lycopene from Tomato Paste**, pp. 75-88

**Prelab questions:** Answer the Prelab Exercise on p. 75. The structures mentioned are on p. 87 of the manual, not p. 184. Also answer 1-5 on p. 94

**Experiments:**

**TLC Part 1:** Analgesics will be performed. You will be provided with microliter pipets, a stockroom prepared eluent of 5% acetic acid in a 1:1 solution of ethyl acetate and cyclohexane, and 2% solutions of aspirin, ibuprofen, acetaminophen, and caffeine to use as standards. You will also be given solutions of several over-the-counter pain medications. These will be identified for you at the beginning of lab. They may be different from the ones in the prelab lecture video.

Your TA will provide you with an unknown in powder form. Be sure to record the code for the unknown in your notebook.

Your goals for this experiment are to identify the components of each medication and to then identify the unknown based on the components present. In the process, you will learn how to perform TLC, which will be used in other labs.

**NOTE:** Sketch each TLC plate to scale in your notebook. Rulers will be provided. All TLC plates must be turned in at the end of lab. Place them in the plastic bag provided and label the bag with your name and ID#. Give the bag to your TA. An evaluation of these plates for appropriate sample application and concentration, proper marking of developed spots, and correct Rf values will contribute to the grade.

**Postlab questions:** 6-12 on p. 95

Jan. 31-Feb. 6 **Separating Cyclohexane and Toluene by Distillation**

Prelaboratory preparation: Read pages 1 – 12 of the lab text. Answer the **Prelab Questions** 1, 2a, 2b, 3 – 5, pp. 25 - 26.

**EXPERIMENT:**



Note: According to the publisher of the lab manual, this experiment may be completed in 3 hours, but we have found that students who are unprepared or do not efficiently make use of their time take longer.

Simple and fractional techniques (macroscale procedures only) will be performed as written with the following exceptions: Record the temperature at 2 mL intervals of distillate. If the column in your drawer is new, use glass beads to pack the fractionating column. Ask for TA assistance.

**Postlab questions:** 1, 2 and, 3 on p. 23. Use the page in your lab notebook after your Experimental/Observations/Data section to plot the graphs constructed in #1. Be sure the graphs cover  $\frac{1}{4}$ -  $\frac{1}{2}$  of the page. Please include the answers to numbers 1 and 3 in the appropriate section of your lab report. (Results/Discussion or Conclusions)

Feb. 7-13

Prelaboratory preparation:

**Measuring Melting Points of Compounds and Mixtures:** Taking a melting range is an important technique that is often used in the organic lab. However, a full lab report will not be written for this technique. Read pp. 27-33 and answer **Prelaboratory questions 1 and 2** on pp. 39-40.

Read **Purifying Acetanilide by Recrystallization**, pp 41-49. Answer **Prelaboratory questions 1-4**, pp. 53-54.

EXPERIMENTS:

**Measuring Melting Points:**

**Pre-Lab Video Notes:** In Part 1, the melting point of benzoic acid is given incorrectly as 250 °C. The pre-lab video also describes Part 3 (mixture melting points) in detail. This is not performed.

Part 1: For practice with the Digi-Melt, you will take the melting range of benzoic acid only. In the Experimental Procedure of the Recrystallization report, include a step that says, "The melting point of benzoic acid was obtained."

Parts 2 and 3 are not performed.

In the Experimental/Observations/Data section of the Recrystallization report, note the temperature at which **you** observe the first drop of liquid appear and the temperature at which the last crystal melts for the benzoic acid sample. This is the melting range. In the Results/Discussion section of the Recrystallization report, comment on the purity of the benzoic acid.

**Recrystallization:** Perform as written. The starting amount of acetanilide may be changed.

**Note Carefully:** Retain the products of all experiments until you are given instructions about what to do with them. In this case, retain the recrystallized acetanilide for determination of its melting point after it is completely dry (one week).

**Additional notes:**

In the lab manual, the specification of a quantity as, for example, "60 mg of benzoic acid" does not mean precisely 60 mg, but rather about 60 mg weighed to the precision of the balance. Always record the actual mass weighed for use (example 59.51 mg), not the mass specified in the procedure (60 mg). To insure

reproducibility in weighing, always use the same balance when you tare the container and later when you weigh the container plus the recrystallized material.

**Postlab questions:** 1- 3, p. 51. (Special note for #2, p. 51: Include answers in the Results and Discussion section of the report. Remember to use the correct starting amount of acetanilide.)

Feb. 14-20      Prelab preparation: Read **Separating Acids and Neutral Compounds by Solvent Extraction**, pp. 55-60, 65-69

**Prelab questions:** 1-4, pp. 73-74

Experiment: You will perform the macroscale procedure only. (Microscale flow chart on p. 61 still applies.)

**Note Carefully:** In this and all subsequent experiments, ether is to be removed by rotary evaporator, not by evaporation into the atmosphere. The TA will demonstrate the use of this instrument.

**Important addition:** The purity of each isolated compound will be checked by melting point and TLC next week. Be sure to sketch the TLC plate to scale in your lab notebook and turn in the plate to your TA. Consider the evidence provided by MP and TLC and comment on the efficiency of **each step** of the extraction in your lab report.

**Postlab questions:** 1-6, p. 71. (Special note: The answer to #1 should be included in the Calculation section, and the answer to # 6 should be included in the Results and Discussion section of your report.)

Feb. 21-27      Prelab preparation: Read **Isolating Clove Oil from Cloves Using Steam Distillation**, pp. 97-103, 110-113.

**Prelab questions:** 1-3, p. 117.

Experiment: The semi-microscale procedure will be performed.

**Note the following changes:** A 250 mL round-bottom flask will be substituted for the 100 mL round-bottom flask in Figure 2 on page 100. A glass stopper will be substituted for the thermometer adapter and thermometer in that figure. t-Butyl methyl ether, not methylene chloride, will be used to extract the clove oil. With this change the organic layer is the top layer, and the aqueous layer is the bottom layer. The ether is removed by rotary evaporator.

The clove oil will be characterized next week using the bromine and  $\text{KMnO}_4$  tests and analyzed with TLC. Be sure to sketch the TLC plate to scale in your lab notebook and turn in the plate to your TA.

**Post lab questions:** 1, 2, 3a, 3b, 4, 5 on p. 115. (#1 should be included in the Calculations and Results sections of your lab report.

Feb. 28-Mar. 6      Prelab preparation: Read **Classification and Identification of Hydrocarbons**, pp. 119-124.

**Prelab questions:** 1-3, p. 125.

Experiments:

**Physical Properties:** Perform parts 1 and 2 as written.

**Chemical Properties:** Omit Part 1, Perform parts 2-4 as written with the exception that  $ZnCl_2$  will be substituted for  $AlCl_3$ . Petroleum ether will be substituted for ligroin. For part 5, you will identify unknowns as alkane, alkene, or aromatic. Be sure to record the identifying codes for your unknowns.

**Postlab questions:** 1-3, p. 128.

Mar. 7-11, 20 Prelab preparation: Read **Nucleophilic Substitution of Alkyl Halides**, pp. 141-148.

**Prelab question:** Answer the Prelab Exercise on p. 141.

Experiments: Perform part 1 (sodium iodide in acetone) and part 2 (ethanolic silver nitrate) with groups 1, 2, and 3. In group 2, 1-chloro-2-methylpropane will be substituted for 1-chloro-2-butene. In the reaction to determine the affect of solvent polarity on the rate of the  $SN_1$  reaction, 2-bromobutane will be substituted for 2-chlorobutane.

Note: Two drops are approximately 0.1 mL.

For grading, a significant number of points in the report are attributed to your interpretation of the results in terms of substrate reactivity under the  $SN_1$  and  $SN_2$  conditions. Please be sure to thoroughly address the four statements listed at the bottom of page 147 and the top of page 148 in the lab manual.

**Postlab questions:** 1-3, p. 148.

Mar. 13-18 SPRING BREAK!!

Mar. 21-27 Prelab preparation: Read **Brominating Alkenes** pp. 149-159.

Note: According to the publisher of the lab manual, both reactions may be completed in 3-4 hours.

**Prelab questions:** 1-4, p. 161. NOTE: For #2: Omit cinnamic acid. You may refer to this answer later in the Calculation section of the report. For #4: Omit cinnamic acid. (The structures mentioned in 4a are included in the reactions written in the Reaction section of the report.)

Experiments: *Cis*-stilbene and *trans*-stilbene will be brominated using microscale quantities and the apparatus in Fig. 5 (the semi-microscale apparatus).

The melting range for each product will be determined next week.

**Postlab questions:** 1-3, p. 160. NOTE: The answers should be included in the appropriate section of your lab report.

Mar. 28-Apr. 3 Prelab preparation: Read **Methylcyclohexenes: Alcohol Dehydration**, pp. 163-165.

**Prelab questions:** 1, 2, p. 164.

Experiment: Parts A, C, and D will be performed with the following changes:

**Part A:** Use 6.0 mL of 2-methylcyclohexanol and 5 mL of 85% phosphoric acid. Use the simple distillation apparatus pictured in Fig. 3 on p.6. Instead of a

graduated cylinder, use a round bottom flask as the receiver. Use a heating mantle for the heat source.

Simple distill the mixture until about 1 mL is left in the pot. Transfer the distillate to a centrifuge tube. Allow the layers to separate and remove the water layer with a pipet. Add approximately 1 gram of sodium sulfate instead of calcium chloride to the tube, cap, shake, and allow to stand for 10 minutes. Using a clean, dry pipet, transfer the dried product to a pre-weighed sample vial. Boiling point is not determined. Weigh the product and determine the % yield of the isomer mixture.

**Part C:** Gas Chromatography: Dissolve 2-3 drops of product in 1 mL of pentane. Compare your chromatogram to the standards posted. Identify the product peaks and estimate the ratio of products produced. (The calculation of ratios from the GC is described in the Pre-lab video. If greater understanding of the GC technique is desired, read Gas Chromatography, pp. 129-139 in the lab manual. **Be sure to include the chromatogram with your lab report.**

**Part D:** Perform as written with product and blank only.

**Postlab questions:** 3,4, p. 165.

**IMPORTANT NOTE:** Be sure to pick up the Grignard Reaction handout for next week. If any of the glassware needed for next week's experiment is not clean, wash it before you leave the lab. Do not wait until next week.

Apr. 4-10      The Grignard Reaction: Read Chapter 10, sections 8, 9a-e, and 10 in the Wade textbook. Everything else is in the handout.

**Note:** The key to success in this reaction is a dry environment! Carefully dry all glassware as described by the TA. Immediately replace the caps on all reagents used, especially the ether.

**Prelab questions:** see handout

**Postlab questions:** see handout

Apr. 11-17      Finish Grignard Reaction

Read **Identifying an Unknown Alcohol**, pp. 185-191.

**Prelab questions:** 1-3, 5,6 pp. 195-196.

Experiments: Parts 1-3 will be performed as written. Begin with parts 2 and 3. After identifying your unknown as a 1°, 2°, or 3° alcohol, perform 1a or 1b accordingly. For the unknown, report both the alcohol class (1°, 2°, or 3°) and identity of the unknown to receive full credit.

**Postlab questions:** 1-5, p. 205. NOTE: The answer to #1 should be included in the Results and Discussion section.

**Important Note:** If time permits, wash all glassware and make sure that all of the necessary equipment is in your drawer for check-out next week. It is your responsibility to replace anything lost or broken during the semester by purchasing at the NSM Research Store.

Apr. 18-24 Final Exam (Cumulative) and Check-out.

On the following pages you will find syllabus language required and recommended by the University of Houston. All may not apply to the lab.

## Required Language for Courses with a Face-to Face Component

If you are experiencing any COVID-19 symptoms that are not clearly related to a pre-existing medical condition, do not come to class. Please see [Student Protocols](#) for what to do if you experience symptoms and [Potential Exposure to Coronavirus](#) for what to do if you have potentially been exposed to COVID-19. Consult the (select: [Undergraduate Excused Absence Policy](#) or [Graduate Excused Absence Policy](#)) for information regarding excused absences due to medical reasons.

## Required Language for All Courses

### COVID-19 Information

Students are encouraged to visit the University's [COVID-19](#) website for important information including diagnosis and symptom protocols, on-campus testing, and vaccine information. Please check the website throughout the semester for updates.

### Vaccinations

Data suggests that vaccination remains the best intervention for reliable protection against COVID-19. Students are asked to familiarize themselves with pertinent [vaccine information](#) and to consult with their health care provider. The University strongly encourages all students, faculty and staff to be vaccinated.

### Reasonable Academic Adjustments/Auxiliary Aids

The University of Houston complies with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, pertaining to the provision of reasonable academic adjustments/auxiliary aids for disabled students. In accordance with Section 504 and ADA guidelines, UH strives to provide reasonable academic adjustments/auxiliary aids to students who request and require them. If you believe that you have a disability requiring an academic adjustments/auxiliary aid, please contact [the Justin Dart Jr. Student Accessibility Center](#) (formerly the Justin Dart, Jr. Center for Students with DisABILITIES).

### Excused Absence Policy

Regular class attendance, participation, and engagement in coursework are important contributors to student success. Absences may be excused as provided in the University of Houston [Undergraduate Excused Absence](#)

[Policy](#) and [Graduate Excused Absence Policy](#) for reasons including: medical illness of student or close relative, death of a close family member, legal or government proceeding that a student is obligated to attend, recognized professional and educational activities where the student is presenting, and University-sponsored activity or athletic competition. Under these policies, students with excused absences will be provided with an opportunity to make up any quiz, exam or other work that contributes to the course grade or a satisfactory alternative. Please read the full policy for details regarding reasons for excused absences, the approval process, and extended absences. Additional policies address absences related to [military service](#), [religious holy days](#), [pregnancy and related conditions](#), and [disability](#).

### Recording of Class

Students may not record all or part of class, livestream all or part of class, or make/distribute screen captures, without advanced written consent of the instructor. If you have or think you may have a disability such that you need to record class-related activities, please contact the [Justin Dart, Jr. Student Accessibility Center](#). If you have an accommodation to record class-related activities, those recordings may not be shared with any other student, whether in this course or not, or with any other person or on any other platform. Classes may be recorded by the instructor. Students may use instructor's recordings for their own studying and notetaking. Instructor's recordings are not authorized to be shared with *anyone* without the prior written approval of the instructor. Failure to comply with requirements regarding recordings will result in a disciplinary referral to the Dean of Students Office and may result in disciplinary action.

### Syllabus Changes

Due to the changing nature of the COVID-19 pandemic, please note that the instructor may need to make modifications to the course syllabus and may do so at any time. Notice of such changes will be announced as quickly as possible through (*specify how students will be notified of changes*).

## **Recommended Language**

### Resources for Online Learning

The University of Houston is committed to student success, and provides information to optimize the online learning experience through our [Power-On](#) website. Please visit this website for a comprehensive set of resources, tools, and tips including: obtaining access to the internet, AccessUH, and Blackboard; requesting a laptop through the Laptop Loaner Program; using your smartphone as a webcam; and downloading Microsoft Office 365 at no cost. For questions or assistance contact [UHOnline@uh.edu](mailto:UHOnline@uh.edu).

### UH Email

Please check and use your CougarNet email for communications related to this course. To access this email, [login](#) to your Microsoft 365 account with your CougarNet credentials.

**Added by Mary Bean:** If I contact the whole lab section, I will use the uh.edu email address provided by the peoplesoft roster of the class.

### Webcams

Access to a webcam is required for students participating remotely in this course. Webcams must be turned on (*state when webcams are required to be on and the academic basis for requiring them to be on*). (Example: Webcams must be turned on during exams to ensure the academic integrity of exam administration.)

### Academic Honesty Policy

High ethical standards are critical to the integrity of any institution, and bear directly on the ultimate value of conferred degrees.

All UH community members are expected to contribute to an atmosphere of the highest possible ethical standards. Maintaining such an atmosphere requires that any instances of academic dishonesty be recognized and addressed. The [UH Academic Honesty Policy](#) is designed to handle those instances with fairness to all parties involved: the students, the instructors, and the University itself. All students and faculty of the University of Houston are responsible for being familiar with this policy.

### Title IX/Sexual Misconduct

Per the UHS Sexual Misconduct Policy, your instructor is a “responsible employee” for reporting purposes under Title IX regulations and state law and must report incidents of sexual misconduct (sexual harassment, non-consensual sexual contact, sexual assault, sexual exploitation, sexual intimidation, intimate partner violence, or stalking) about which they become aware to the Title IX office. Please know there are places on campus where you can make a report in confidence. You can find more information about resources on the Title IX website at <https://uh.edu/equal-opportunity/title-ix-sexual-misconduct/resources/>.

### Security Escorts and Cougar Ride

UHPD continually works with the University community to make the campus a safe place to learn, work, and live. Our Security escort service is designed for the community members who have safety concerns and would like to have a Security Officer walk with them, for their safety, as they make their way across campus. Based on availability either a UHPD Security Officer or Police Officer will escort students, faculty, and staff

to locations beginning and ending on campus. If you feel that you need a Security Officer to walk with you for your safety please call [713-743-3333](tel:713-743-3333). Arrangements may be made for special needs.

Parking and Transportation Services also offers a late-night, on-demand shuttle service called Cougar Ride that provides rides to and from all on-campus shuttle stops, as well as the MD Anderson Library, Cougar Village/Moody Towers and the UH Technology Bridge. Rides can be requested through the UH Go app. Days and hours of operation can be found at <https://uh.edu/af-university-services/parking/cougar-ride/>.

### Helpful Information

Coogs Care: <https://uh.edu/dsa/coogscare/>

Student Health Center: <https://www.uh.edu/healthcenter/>