Please see https://uh.simplesyllabus.com/ for section/semester specific details

CHEM 2123 | Organic Chemistry Lab I

Section: _____| Face-to-Face
_____ | University of Houston; Science Teaching Laboratory; STL ____

Prerequisite(s): CHEM 1112 and credit for or concurrent enrollment in CHEM 2323. Syntheses, reaction mechanisms, and qualitative organic analysis.

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**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 or if changes in the availability of required chemicals occur. **

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I. Lab Coordinator- Office and Email:

Dr. Crystal Young, Office TBD, cayoung@uh.edu (Try Teams First! I will not respond to any message on any other platform)

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.

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

Your TA's name:_____ Office:_____ Office hours:_____

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.)

II. Lab Students Requiring Assistance under the Americans with Disabilities Act:

Please make an appointment with me within the first two weeks of class to discuss your accommodations.

Required Instructional Materials

III. Supplies for Lab:

For the laboratory you will need the following items:

1. **The textbook**: "Organic Lab Manual, Custom 2nd 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 pre-numbered pages, and 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, short skirts, and short 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.

A special note about locks:

If you did not bring 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.

Organic Lab Manual, Custom 2nd Edition – University of Houston
ISBN: 9781337453042
Publisher: Cengage Learning

IV. Lab Safety:

The Department of Chemistry takes safety seriously. All safety rules described on page 1 of the lab manual and in the safety video are important for your SAFETY. Two rules are given extra attention below.

Goggles:

Wearing your goggles over your eyes (not on your forehead, on the top of your head, or around your neck) is required from the time anyone in the laboratory begins experimental work until **you leave the lab**. These times include while you are writing in your lab notebook, using the melting point apparatus or balance, washing glassware, cleaning up at the end of lab, taking an IR spectrum, and talking to your TA at the TA bench. This precaution may save your eyesight.

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.

Cell Phone, Laptop, or Tablet Use:

Being distracted while performing laboratory work can be dangerous. Use of these electronic devices is a distraction and is prohibited in lab. Common solvents used in the lab, such as acetone, can corrode the components of these devices. The chemistry department is not responsible for any damage caused to these devices if they are used in the lab.

Grading Rubrics and Weights

V. Grading Policies:

A. Lab Reports: 60% of the grade

A copy of the Lab Report Format with details is given later in the syllabus. There are eleven lab reports for the semester. The Pre-lab (sections I-V) is due and must be given to your TA at the beginning of each lab period. The Experimental Procedure/Observations/Data section (Section VI) is due at the end of the lab period and must be given to the TA before you leave the lab. The Post-

lab (written after lab, 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 grade 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.

Late Lab Reports: 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.

B. Quizzes: 15% 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.

C. Final Exam: 25% of grade (Covers everything.)

D. 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

VI. 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. Young.

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

VII. Make-Up Policy:

A. **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. Young), 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. Young) 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.

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

VIII. 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) 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

IX. Broken or Missing Equipment Policy:

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 Store 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 must 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 must ask your Lab Coordinator (Dr. Young) for permission to come to a different lab to finish your experiment. An alternate lab may not be available, and 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 with you 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.

X. Care of Equipment, the Lab Space, and Reagents:

A. The fancy equipment:

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.

B. Liquid Reagents:

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.

C. Solid Reagents:

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.

D. Any Reagent:

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 return 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.

XI. The Laboratory Notebook (What to do with it and how to make corrections):

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.

Some experiments may extend over two lab periods, so 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 each period.

Corrections of in the notebook must be made in such a way that the original data or 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).

XII. The Laboratory Report Format (How to write the lab report):

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, www.fishersci.com, or 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 or shortly after you perform it. Do not 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 Rf 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.

XIII. When the Sections of the Lab Report Are Due:

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 for credit.

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 by 8:30 PM two days after completion of the lab. (Example: The reports of Monday sections are due on Wednesday by 8:30 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 be due two days after the work is completed. Your TA will describe the procedure for turning in this section of the report. In some cases, a pdf of the report may be emailed to your TA or uploaded to Canvas as proof that your report was completed by the deadline. The hardcopy of the report must be turned in **no later than two days after the deadline, and it must match the pdf**. Only the hardcopy is graded for credit.

Course Schedule, Assignments, and Assessments

XIV. 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 and carefully read all information related to the experiment**.

SPECIAL NOTE: A link to the pre-lab video lectures is below. Watching the videos and taking notes 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 always be shown at the beginning of each lab period. You are required to watch theses video in the lab. No work may be started during these videos.

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. Tuesday sections will be the first lab to perform the new experiment and Monday sections will be the last sections to perform any experiment. For example, when lab work is designated for January 13-18, it does not mean that a student can choose any day in that week to do the work. For example, students in Monday sections will do the work on January 13. Students in Tuesday sections will do the work on January 14, etc. Always pay careful attention to the dates given in the syllabus.

Week 1 Orientation lecture, check-in. Wash glassware if necessary and watch film on Lab Safety.

Labor Day Holiday – No sections meet today. Tuesday – Saturday sections will meet this week. Note: After Labor Day, the Monday sections will be at the end of the “lab week”. This

means that the Tuesday sections will be the first to perform any experiment and the Monday sections will be the last to perform any experiment.

Week 2 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

Week 3 **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 ¼- ½ of the page. Please include the answers to numbers 1 and 3 in the appropriate section of your lab report. (Results/Discussion or Conclusions)

Week 4 Prelaboratory preparation:

A. 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.

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

EXPERIMENTS:

A. 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.

Academic Honesty WARNING: Melting Range Procedure

The following is the **correct procedure** for obtaining the melting range of a sample when the melting point is known:

The sample is quickly heated to within 10-15°C of its melting point. The heating rate is then slowed to increase 1-2°C per minute until the sample melts.

Setting the digimelt apparatus to rapidly rise through the melting range is NOT the correct procedure and may result in a loss of points or a charge of academic dishonesty.

Example:

If a student allows the temperature to rapidly rise and then puts an impure sample into the digimelt apparatus when the temperature is slightly below the literature value, the sample will instantly melt. (This is NOT correct procedure.) When the TA checks the melting point of the student’s sample, and it melts far below the temperature reported by the student, the student will be charged with engaging in academic dishonesty, not with making a mistake in melting point procedure.

B. 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.)

Week 5 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.)

Week 6 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 $KMnO_4$ 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.

Week 7 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.

Week 8 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 SN1 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 SN1 and SN2 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.

Week 9 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.

Week 10 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 mantel 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.

Week 11 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: None

Week 12 Finish Grignard Reaction AND perform the experiment below.

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.

Week 13 Final Exam (Cumulative) and Check-out.

General Course Information

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

Crystal A Young
Department: Chemistry
Email: cayoung@uh.edu Try Teams First!
Office Hours
Mon./Wed.: 1-3:00 PM, T/Th 2:30-3:30 PM

University Policies and Student Support Resources

Mental Health and Wellness Resources

The University of Houston has a number of resources to support students' mental health and overall wellness, including CoogsCARE and the UH Go App. UH Counseling and Psychological Services (CAPS) offers 24/7 mental health support for all students, addressing various concerns like stress, college adjustment and sadness. CAPS provides individual and couples counseling, group therapy, workshops and connections to other support services on and off- campus. For assistance visit uh.edu/caps, call 713-743-5454, or visit a Let's Talk location in-person or virtually. Let's Talk are daily, informal confidential consultations with CAPS therapists where no appointment or paperwork is needed.

Need Support Now? If you or someone you know is struggling or in crisis, help is available. Call CAPS crisis support 24/7 at 713-743-5454, or the National Suicide and Crisis Lifeline: call or text 988, or chat 988lifeline.org.

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 (known at UH as the Equal Opportunity Services office or "EOS"). Please know there are places on campus where you can make a report in confidence. You can find more information about resources on the UH Title IX/Sexual Misconduct Resources page. Please note that you may also report concerns of discrimination based on your protected class identity to EOS.

Reasonable Academic Adjustments/Auxiliary Aids

The University of Houston is committed to providing an academic environment and educational programs that are accessible for its students. Any student with a disability who is experiencing barriers to learning, assessment or participation is encouraged to contact the Justin Dart, Jr. Student Accessibility Center (Dart Center) to learn more about academic accommodations and support that may be available to them. Students seeking academic accommodations will need to register with the Dart Center as soon as possible to ensure timely implementation of approved accommodations. Please contact the Dart Center by visiting the website: https://uh.edu/accessibility/ calling (713) 743-5400, or emailing jdcenter@Central.UH.EDU.

The Student Health Center offers a Psychiatry Clinic for enrolled UH students. Call 713-743-5149 during clinic hours, Monday through Friday 8 a.m. - 4:30 p.m. to schedule an appointment.

The A.D. Bruce Religion Center offers spiritual support and a variety of programs centered on well-being.

The Center for Student Advocacy and Community (CSAC) is where you can go if you need help but don’t know where to start. CSAC is a “home away from home” and serves as a resource hub to help you get the resources needed to support academic and personal success. Through our Cougar Cupboard, all students can get up to 30 lbs of FREE groceries a week. Additionally, we provide 1:1 appointments to get you connected to on- and off-campus resources related to

essential needs, safety and advocacy, and more. The Cougar Closet is a registered student organization advised by our office and offers free clothes to students so that all Coogs can feel good in their fit. We also host a series of cultural and community-based events that fosters social connection and helps the cougar community come closer together. Visit the CSAC homepage or follow us on Instagram: @uh_CSAC and @uhcupbrd. YOU belong here.

Women and Gender Resource Center

The mission of the WGRC is to advance the University of Houston and promote the success of all students, faculty, and staff through educating, empowering, and supporting the UH community. The WGRC suite is open to you. Stop by the office for a study space, to take a break, grab a snack, or check out one of the WGRC programs or resources. Stop by Student Center South room B12 (Basement floor near Starbucks and down the hall from Creation Station) from 9 am to 5 pm Monday through Friday.

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.

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.

Course Policies and Procedures

Sections VI & VII & IX

Discussion and Lecture Topics

please see

Course Schedule, Assignments, and Assessments

Course Objectives and Student Learning Outcomes

Upon completion of this course, the student will be able to: 1. Demonstrate their knowledge of departmental safety rules through their laboratory practice, including the ability to dispose of waste properly. 2. Apply basic stoichiometric algorithms (calculating limiting reagents, theoretical yield, mole ratios) in the context of organic chemistry. 3. Demonstrate a command of the rules for assigning significant figures in their work, specifically in calculations and laboratory measurements and calculations. 4. Understand and be able to use the basic operations of an organic chemistry laboratory including gravity and vacuum filtration, liquid-liquid extraction, simple and fractional 1 distillation, reflux, recrystallization, thin-layer chromatography, gas

chromatography, drying of solids and solutions, and the theories behind these techniques. 5. Be able to follow a detailed experimental procedure and construct a flow diagram to illustrate it. 6. Identify and assess the purity of organic compounds using analytical techniques, including melting point, thin-layer chromatography, IR, and gas chromatography. 7. Deduce organic structures using spectroscopic methods, including infrared (IR), 1H-and 13C- nuclear magnetic resonance spectroscopy, and mass spectrometry 8. Depict and explain detailed chemical mechanisms for all laboratory reactions (and their related reactions) 9. Demonstrate the ability to properly maintain a laboratory notebook 10. Construct a lab report that includes an analysis of the data collected, and discussion of the outcomes and answers to open questions associated with the experiment.