

CH 220C
ORGANIC CHEMISTRY LABORATORY
Spring, 2024

11. GENERAL INFORMATION

PRE- and CO-REQUISITES

Pre- and co-requisites for CH 220C listed in the Course Schedule. *Important:* Because the lecture and laboratory courses are co-requisites of each other, dropping one of them requires that you drop the other as well, *unless* the drop occurs during the final 2 laboratory periods of the term.

Pre- and co-requisites will be checked and students not meeting the requirements *must* drop the course.

REQUIRED or RECOMMENDED COURSE MATERIALS

- A. Lab Notebook: A “carbon copy” notebook with quadrille-ruled pages with page numbers. The recommended notebook will be sold by the coop.
- B. One Combination Lock: This must be a sturdy combination lock. UT Chem locks are available at the University Co-op. You **MUST** have it for check-in. Otherwise, you will *not* be allowed to check into the laboratory until you have obtained the required locks.
- C. UT ID card: Bring your UT ID card to every laboratory session. It is needed to obtain items from the stockroom.
- D. Custom Gilbert and Martin Ebook through Longhorn Textbook Access Program

2. SAFETY INFORMATION

****READ THE GENERAL SAFETY RULES ON THE WEBPAGE****

You are expected to follow all the safety requirements in the course. Not following the safety rules could result in your removal from the lab and/or the course.

CLOTHING

Street Clothes: Shorts or short skirts *cannot* be worn in the laboratory **at any time**, *with or without a lab coat*. Your shirt must at least have short sleeves and cover your torso, *i.e.*, tank tops are *not* permitted.

Note: If you wear these to laboratory you will be sent home to change. On hot days you may wish to bring a pair of jeans or sweatpants to change into before entering the lab.

Shoes: Closed-toe shoes *must* be worn, *i.e.* sandals or clogs are not allowed.

SAFETY GOGGLES

The clear safety goggles provided by the department *must be worn at all times* in the lab. *If your vision is corrected*, wear your glasses *under* the clear safety goggles. Safety glasses *are not permitted* as substitutes for the goggles. *Not* wearing goggles in the laboratory may result in your expulsion for the remainder of the period.

LAB COATS

The blue lab coats provided by the department *must be worn at all times* in the lab. Wearing a lab coat does not excuse you from being properly dressed. Not wearing a lab coat will result in your being removed for the remainder of the period. The coat must be buttoned all the way to the top and the sleeves need to be unrolled.

JEWELRY

It is strongly recommended that you *not* wear rings, bracelets, or watches to the lab. Such items can trap chemicals next to your skin, thereby worsening the effects of burns or allergic reactions. Also NOTE that the solvents used in this course may permanently mar the synthetic materials contained in watchbands and crystals!

3. ATTENDANCE

LAB LECTURE

Attendance at the laboratory lecture before your regularly scheduled laboratory period is *required*. This lecture provides some of the general "How To's of Organic Chemistry", and helpful hints on performing the experiments. It also correlates the laboratory experiments with the topics being covered in the lecture section. Much of this information *is not written* down anywhere; the only way to get it is from the lecture. Material discussed in the laboratory lecture is also one of the primary sources of material for the quizzes in the course.

LABORATORY

Attendance will be taken at all laboratory sessions. You will not receive credit for any experiment scheduled for a laboratory period for which you have an unexcused absence. If you have an excused absence, you must obtain a make-up permit before you will be permitted to work in any of the labs outside of your own regularly scheduled laboratory period.

You must do all experiments by yourself unless otherwise specified. If you are found to have completed an experiment in a group without being instructed to do so by Dr. Fjetland (**he is the only one who can grant this**), then your grade for that experiment will automatically be assigned a "0." This policy is also retroactive.

In some cases, data will be collected by groups of two or more students. Zero credit will be given if you are not present or did not participate in the experimental work. You are NOT PERMITTED to use data collected by others in the group work if you are not present at the time the work is done unless given explicit permission to do so by Dr. Fjetland.

MAKE-UP POLICY

Everyone is allowed one missed lab and will be able to make that one up. After the first one, only *excused* absences may be made-up. Excused absences are those that are beyond your control, such as major emergencies, university events that you must attend, and illness. Unexcused absences include things but are not limited to interviews, work, and exams. To be eligible for a make-up laboratory period, you must request a permit for the make-up from Dr. Fjetland **within one week** of the excused absence.

All makeup labs are held on Fridays from 1:00-5:00 pm. You will be assigned a specific Friday to attend your makeup lab. You must have a make-up permit and must be on time to be eligible for the make-up lab. The make-up reports are due when stated by Dr Fjetland on the makeup permit.

4. LABORATORY PROTOCOL

ASSIGNED READING

Prior to each laboratory lecture, you should read any suggested material.

PRE-LAB QUIZZES

A pre-lab quiz will be given during the first 10 minutes of wet lab. The questions will be based upon the safety, procedure, and the theory of the experiment. The quiz is closed, which means no notes or books allowed during the quiz. If you miss the lab and are granted a make-up permit, you will take the make-up quiz during the make-up lab.

LAB NOTEBOOK

The laboratory notebook is a critical record of your accomplishments in the laboratory so you should treat it accordingly by making careful and complete entries in it. Your lab notebook must be written in ink. If an error is made, draw a single line through the error and then continue. Note that the *original* pages in your laboratory notebook should never be removed; rather, turn in the *carbon copies* of these pages as directed. The pages should be sequentially numbered, and your name should appear at the upper right-hand corner of each page. Leave the first 2 pages of the notebook blank for future use as a TABLE OF CONTENTS. This notebook is the last line of defense if there are any problems with grades, which means **DON'T THROW IT OUT.**

Note: All prelab and postlab write-ups are to be done by yourself. Data interpretation and analysis are your individual responsibility and must also be done by yourself. Otherwise, the actions of the cheating policy (see Section 7) are applicable.

There is only 1 format for the laboratory notebook consisting of the following:

PRELAB

The Prelab will consist of the following:

1. **Heading:** Use a new page of the notebook to start the entries for the experiment. Provide information that includes your name, the date, the title of the experiment, and a reference to the place in the laboratory textbook or other source where the procedure may be found. (WRITTEN IN NOTEBOOK)
2. **Safety Analysis:** Safety is broken into three parts. The first part is identifying the appropriate standard operating procedures (SOPs). Simply list them in your notebook (you might want to print them out so you have access to them in the lab). The SOPs are located on the course web page. The second part is conducting a hazard analysis for some given chemicals and/or equipment (a total of four). For each chemical and piece of equipment, you will be given a scenario. For each scenario, explain the potential danger it poses (ie: loss of vision, severe burns etc.), how to avoid it and finally how to rectify the situation (that is what do you do). The final part is locating the MSDS sheets for each chemical used for the given experiment. The MSDS sheets can be found on the web page. (WRITTEN IN NOTEBOOK except MSDS sheets)
3. **Quest:** Each period has a quest assignment associated with it (BRING PRINTOUT). You must complete and print this assignment for each prelab report. If it is not completed, you will not be allowed into the lab. See the webpage for directions on how to print.

LAB REPORT

The lab report will consist of the following sections: (**All sections are to be in your own words. Don't copy anything!**)

4. **Purpose:** Give a brief introduction to the experiment in which you clearly state the purpose(s) of the experiment. This should require no more than 5-8 sentences. (TYPED)
5. **Data and Results:** Any observations that you make during the experiment belong here. This includes things like the color of the solution when mixed, how the reaction proceeded and what happened when you added a reactant. This section also includes the observed melting point, weight, and percent yield of the product. You must also put any and all spectra, TLC or other type of data in this section. (WRITTEN IN NOTEBOOK OR PRINTOUTS)
6. **Data and Results Analysis:** Analyze the data to determine what it means. Such as the purity of your product. This can be deduced from the melting point. A list of specific questions for your data analysis will be given to you for each experiment. Answer these questions in your notebook in order as they are listed and be sure to write the question before answering it. (WRITTEN IN NOTEBOOK)
7. **Conclusion:** Write a conclusion stating whether the experiment produced or did not produce the expected results. Also provide an explanation as to why or why not. (TYPED)

DUE DATES FOR REPORTS

The Prelab (**Parts 1-3**) is to be completed before the beginning of the laboratory specified in the Work Schedule. The TA will check and sign it to make sure that you have completed it. It is your responsibility to make sure that the TA has checked and signed your prelab. If you haven't completed the prelab when you walk into lab, you will not be allowed in until it is completed, and you will be deducted 100 % credit. Then you must complete the lab in the time remaining when you have finished the prelab report. If you do not finish the lab, you will not be allowed to make it up.

The Lab Report is due as specified in the Work Schedule and consists of **parts 1-7**. Your TA will sign the data section of your notebook after you have completed the experiment. It is your responsibility to make sure that your TA has signed your data section.

All reports (**parts 1-7**) are to be turned in on the due date specified in the due date schedule through gradescope. Anything turned in after that time will be graded as late. Late Reports will receive 50% credit up to one week late. After one week, no credit will be awarded for the report. Combine all parts (**1-7**) and scan them into a single file. Be sure to include any printouts like the Quest completion, IRs or GC chromatograms. Also, be sure to include the Turn-It-In file. Information regarding Turn-It-In can be found on the webpage. **Please ensure that you have printed the Turn-It-In report in the correct format, or it will not be accepted. Directions on how to print your report are on the webpage.**

Make-up labs: All papers due at the missed laboratory period will be due as instructed when given the makeup slip.

5. CHECK-IN/CHECK-OUT

At the assigned laboratory period you will check into a drawer that contains all your equipment. Anything that is missing or broken can be replaced free of charge during the CHECK-IN period. After this time, you will be responsible for all equipment and glassware. At check-out, drawers and lockers will be checked by the TA for broken or missing items, which you must replace. *Be aware that you are responsible for the safe storage of your equipment. Lost or stolen glassware will be reported to the UT Police and may be investigated by them.*

To replace broken glassware or equipment, go to the stockroom with your student ID and purchase the needed replacements. Your bill will show up on the “what I owe” page a couple of weeks after the last class day.

You are required to check out of your drawer upon completing the semester or dropping the course. A charge will be assessed if you are missing or have broken equipment. A check-out fee will be assessed if you fail show up and check out.

6. GRADING PROCEDURE

GRADING SCALE

This laboratory course uses the +/- grading scale. This grading scale has the following distribution:

Grade	Grade Point	Grade GPA Recommended % Range
A	4	≥ 93
A-	3.67	$93 > A- \geq 90$
B+	3.33	$90 > B+ \geq 88$
B	3	$88 > B \geq 82$
B-	2.67	$82 > B- \geq 80$
C+	2.33	$80 > C+ \geq 78$
C	2	$78 > C \geq 72$
C-	1.67	$72 > C- \geq 70$
D+	1.33	$70 > D+ \geq 68$
D	1	$68 > D \geq 62$
D-	0.67	$62 > D- \geq 60$
F	0	< 60

POINT DISTRIBUTION

What	Points
Prelab Report	10 ea
Heading	1
Safety SOPS	2
Hazard Analysis	4 (1 pt ea.)
Quest	3
Post Lab Report	90 ea
Purpose	10
Data and Results	15
Data Analysis	35
Conclusion	15
Technique	15
Quiz	80

FINAL GRADE DETERMINATION

Each laboratory section will be graded independently. TAs will be provided with common guidelines for evaluation of reports. The final laboratory letter grade will be calculated as follows:

- a. A section curve may be established, and a letter grade will be assigned based upon final total score.
- b. To earn a C- or better in the course you must complete all assigned work and turn in all required reports.

REGRADES AND CORRECTIONS

Once an assignment has been returned, you will have one week to get an error corrected. After the week has passed, no regrades or corrections will be made on that assignment. The only exception to this is the correction of an error in the entry of the grade on the computer or an error in addition.

7. POLICY ON CHEATING FOR THE DEPARTMENT OF CHEMISTRY

The University of Texas at Austin expects honesty and integrity to be the ordinary way of life in all student activities. Plagiarism, or the use of another person's statements without giving proper credit, is dishonest and is regarded as cheating. Although group study and projects are often appropriate, it is expected that individual assignments and examinations will be the private efforts of the particular student. A student detected cheating beyond any reasonable doubt in the preparation of any individual assignment is subject to disciplinary action. See the General Information Bulletin.

The following are considered examples of cheating:

1. Copying raw data for a laboratory without actually participating in acquisition of the raw data.
2. Inventing data.
3. Filling in parts of laboratory reports that require the raw data for calculations or interpretation before the data are collected.
4. Holding discussions so thorough that they result in identical or nearly identical laboratory reports.
5. Allowing anyone to copy any laboratory report, either now or in the future.
6. Gaining access to, having in your possession at any time, or using old laboratory reports for any purpose. If you have questions regarding the format of any laboratory write-up, you should consult your TA or AI.
7. Gaining access to, having in your possession, using or distributing at any time grading rubrics.

PROPER CITATION

To avoid plagiarism issues, it is best to never copy anything and to cite properly. For more information regarding proper citation, use the following links as resources.

1. http://deanofstudents.utexas.edu/sjs/acadint_avoid_ack_conv.php
2. <http://uwc.utexas.edu/>

8. TA OFFICE HOURS

TAs will hold zoom office hours at times and places posted on the web page. Feel free to consult with any TA and to ask questions concerning either laboratory or lecture material.

It is Departmental policy that undergraduate students are not permitted in research laboratories. If you wish to consult your TA outside of his/her scheduled office hours, use e-mail and your TA will contact you.

9. FACULTY COURSE COORDINATOR

Dr. Conrad Fjetland
Office: NHB 1.128
Phone: 232-7676
crfjetland@cm.utexas.edu
Office hours: M 12-1, Th 10-11 in person

10. COURSE WEB PAGE

A web page has been developed for the course. Among other things, it provides the course syllabus, a listing of office hours, and links to MSDS information and web pages, if any, for the various lecture sections associated with the lab sections. The URL is <http://fjetland.cm.utexas.edu/courses/organiclab/>.

11. HINTS TO MINIMIZE FRUSTRATIONS IN ORGANIC CHEMISTRY

Organic chemistry is one of the most exciting and challenging courses you will encounter at UT-Austin. The course encompasses a broad range of topics including petrochemicals, polymers, pharmaceuticals, and life-sustaining biochemical processes. Organic chemistry can bring immense pleasure and numerous rewards. Yet it may also foster frustrations, most of which involve time constraints. You may often feel overwhelmed by the sheer volume of material to be learned and the amount of work accompanying the demands of the laboratory. These are legitimate concerns. Much information is indeed covered, and considerable time is required both in and out of the laboratory itself.

There tend to be two major gripes that students have concerning the lab:

A. Keeping a laboratory notebook and preparing for experiments require too much time.

Good science practices dictate that certain documentation be present in your laboratory book. Because we believe in teaching good science, this problem cannot be changed. With practice, you should become more efficient at preparing your laboratory book.

B. Students feel rushed during the laboratory period.

To a certain extent, this is true. Most organic experiments involve several steps and techniques, one or more of which is often laborious and time-consuming. This is the nature of the beast. Nonetheless, organic experiments can be fun, especially if you can minimize frustrations. Fortunately, we have more control over time constraints during lab. Handling these problems is merely a matter of time management--making the most efficient use of your time in lab. To that end, the following suggestions should prove helpful:

1. *Come to laboratory prepared.* This point can't be overemphasized. People who know what they are doing before starting are far more efficient than people who must constantly refer back to a procedure to find out what they are going to do next. Advance preparation also lets you find any ambiguous points in the procedure. You can then ask to have these clarified during laboratory lecture.
2. *Start the experiment as soon as possible.* This is usually not a problem. But you should be aware that you don't have time to stop for a soft drink or to chit-chat on the way to the lab, if it occurs immediately following the laboratory lecture.
3. *Familiarize yourself with the location of frequently used chemicals and equipment in the lab.* You will save time by not constantly having to ask where things are.
4. *Make the most efficient use of "dead time."* Many organic experiments have a stirring or reflux period during which there is nothing to do but wait. This time should be used for cleaning glassware and getting chemicals and/or apparatus ready for the subsequent steps. If there are qualitative tests assigned, they may be performed during such periods. These tests should not be done before starting the main reaction.
5. *Don't presume that every reaction will work perfectly (or even at all).* Often, these "tried and true" reactions fail to proceed the way the book describes. Even professional organic chemists with years of experience can't get every reaction to work for them, despite the fact that the reaction may be cited extensively in the scientific literature.
6. *Clean your glassware before you leave lab.* Like your pots and pans at home, laboratory apparatus is far easier to clean just after it is used rather than a week later. You will then be ready to start the next week's experiment without delay.
7. *Remember that your TAs and AI are here to help you.* If you have any problems or feel your frustration level rising, please don't hesitate to talk to us. Here's to a successful, enjoyable semester!

12. TITLE IX, CLERY, SEXUAL MISCONDUCT AND MANDATORY REPORTING

Title IX prohibits sex discrimination to include sexual misconduct: harassment, domestic and dating violence, sexual assault, and stalking. If you or someone you know has been harassed or assaulted, you can receive confidential support University Health Services (512-471-4955 or Nurse Advocacy line 512-475-6877) or the Counseling and Mental Health Center (CMHC). CMHC can be contacted on their 24-hour crisis line, 512-471-2255 or for appointments at 512-471-3515. Finally, the SAFE Alliance has a 24-hour hot line (512-267-7233). Alleged violations can be reported non-confidentially to the University Title Coordinator for students at studentemergency@austin.utexas.edu or 512-471-5017. Reports to law enforcement can be made to University of Texas at Austin Police Department at 911 or 512-471-4441.

Crimes that occur on school grounds and within school-owned or controlled buildings qualify for reporting under the Clery Act. It is important to note that this includes more than just main campus – we own buildings all over Austin and own or control real estate all over the world. The reporting rules apply to faculty and other employees when they are traveling to foreign locations with students. We are also required to record crimes at certain non-campus facilities, which includes public property adjacent to the institution. If you suspect a crime has occurred or are the victim of a crime, please contact UTPD at 512-471-4441.

As instructors, one of our responsibilities is to help create a safe learning environment on our campus. We also have a mandatory reporting responsibility related to our role as instructors for the Department of Chemistry. We are required to share information regarding sexual misconduct or information about a crime that may have occurred on UT's campus with the University. Students may speak to someone confidentially by contacting CMHC's 24-hour hot line (512-471-2255) or the SAFE Alliance's 24 hour hot line (512-267-7233).

13. WORK SCHEDULE

LAB REPORT DUE DATE SCHEDULE*

Report	Due	Report	Due	Report	Due
Distillation	Period 4	9-Fluorenone	Period 8	Luminol	Period 11
Extraction	Period 6	Substitution	Period 8	Dehydrobromination	Period 11
Stereochemistry	Period 6	Grignard	Period 9	EAS	Period 12
Arenes	Period 7	Aldol Condensation	Period 10	Azo Violet	Period 12
Stilbene	Period 7	Fischer	Period 10		

* All reports are due at the beginning of the period. Be sure to submit all required sections to Turn-It-In.

EXPERIMENTS

REQUIRED PRE-LAB PREPARATION! Read about the techniques listed at the start of each experiment in preparation for working in the laboratory.

Period 1	Lab Lecture: 1-25, 1-29	Wet Lab: 1-30, 1-31, 2-1
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What Are We Doing Today?

CHECK-IN

Period 2	Lab Lecture: 2-1, 2-5	Wet Lab: 2-6, 2-7, 2-8
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What Are We Doing Today?

DISTILLATION AND GAS CHROMATOGRAPHY (*Investigative*)
(Procedure, Quest, Procedure, GC, TBA) (**Product Analysis: Identify of Ratio**)

Period 3	Lab Lecture: 2-8, 2-12	Wet Lab: 2-13, 2-14, 2-15
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What Are We Doing Today?

EXTRACTION AND RECRYSTALLIZATION: DAY 1 (*Investigative*)
(Procedure, Quest) (**Product Analysis: MP, % Recovery, Identity of Unknowns**)

Period 4	Lecture: 2-15, 2-19	Wet Lab: 2-20, 2-21, 2-22
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What Are We Doing Today?

EXTRACTION AND RECRYSTALLIZATION: DAY 2

(STEREOCHEMISTRY: ISOMERIZATION OF DIMETHYL MALEATE (*Preparative*) (Procedure, Quest)
(**Product Analysis: MP, % Yield**)

Period 5	Lecture: 2-22, 2-26	Wet Lab: 2-27, 2-28, 2-29
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What Are We Doing Today?

ADDITION REACTIONS OF ALKENES: BROMINATION OF (*E*)-STILBENE (*Preparative*)
(Procedure, Quest) (**Product Analysis: % Yield, MP**)

FREE-RADICAL CHAIN REACTIONS: BROMINATION OF ARENES (*Investigative*)
(Procedure, Quest) (**Product Analysis: Rates of Reactivity**)

Notes for Rates of Reaction

- Predict the order of reactivity before you come to lab and have that prediction in your notebook.
- Work in pairs.

Notes for Stilbene

- Save the meso-stilbene dibromide that you prepared for use in period 9.

Period 6	Lecture: 2-29, 3-4	Wet Lab: 3-5, 3-6, 3-7
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What Are We Doing Today?

NUCLEOPHILIC SUBSTITUTION: PREPARATION OF 2-CHLORO-2-METHYL-BUTANE (*Preparative*)
(Procedure, Quest) (**Product Analysis: IR, % Yield, Halide Tests**)

REDUCTION OF CARBONYL COMPOUNDS: PREPARATION OF FLUORENOL (*Preparative*)
(Procedure, Quest) (**Product Analysis: IR, MP, % Yield**)

Notes for Next Week

- **WASH ALL GLASSWARE NEEDED FOR NEXT WEEKS EXPERIMENT THIS WEEK SO THAT THEY HAVE A WEEK TO DRY.**

Period 7	Lab Lecture: 3-7, 3-18	Wet Lab: 3-19, 3-20, 3-21
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What Are We Doing Today?

ORGANOMETALLIC REACTIONS DAY 1: IDENTIFICATION OF AN UNKNOWN GRIGNARD (*Preparative*)
(Procedures, Quest) (**Product Analysis: MP, MW**)

Period 8	Lab Lecture: 3-21, 3-25	Wet Lab: 3-26, 3-27, 3-28
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What Are We Doing Today?

ORGANOMETALLIC REACTIONS DAY 2: DETERMINATION OF EQUIVALENT WEIGHT
(Procedure, Quest)

ESTERIFICATION: FISCHER ESTERIFICATION (*Preparative*)
(Procedure, Quest) (**Product Analysis: GC, IR, % Yield**)

ALDOL CONDENSATION: PREPARATION OF TRANS-*p*-ANISALACETOPHENONE (*Preparative*)
(Procedure, Quest) (**Product Analysis: IR, MP, % Yield**)

Period 9	Lab Lecture: 3-28, 4-1	Wet Lab: 4-2, 4-3, 4-4
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What Are We Doing Today?

ALKYNE FORMATION: DEHYDROBROMINATION OF *MESO*-STILBENE DIBROMIDE (*Preparative*)
(Procedure, Quest) (**Product Analysis: % Yield, MP**)

CHEMILUMINESCENCE: SYNTHESIS OF LUMINOL
(Procedure, Quest) (**Product Analysis: Did it Glow**)

Notes for Dehydrobromination

- Use the meso-stilbene dibromide that you prepared from period 5. If you did not make enough, some will be provided.

Period 10	Lab Lecture: 4-4, 4-8	Wet Lab: 4-9, 4-10, 4-11
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What Are We Doing Today?

ELECTROPHILIC AROMATIC SUBSTITUTION: FRIEDEL-CRAFTS ACYLATION OF ANISOLE (*Preparative*)
(Procedure, Quest) (**Product Analysis: MP, IR % Yield**)

ELECTROPHILIC AROMATIC SUBSTITUTION: RELATIVE RATES OF REACTION (*Investigative*)
(Procedure, Quest) (**Product Analysis: Relative rates of Reaction**)

These are to be written as one Report

Notes for Rates of Reaction

- Predict the order of reactivity before you come to lab and have that prediction in your notebook.
- Work in pairs.

Period 11	Lab Lecture: 4-11, 4-15	Wet Lab: 4-16, 4-17, 4-18
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What Are We Doing Today?

PREPARATION OF A DYE: AZO VIOLET (*Preparative*)
(Procedure, Quest) (**Product Analysis: Dyeing analysis, pH affect**)

Period 12	Lab Lecture: 4-18, 4-22	Wet Lab: 4-23, 4-24, 4-25
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What Are We Doing Today?

CHECKOUT