BOSTON UNIVERSITY - GRENOBLE

ORGANIC CHEMISTRY LABORATORY

FALL 2013

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Required Text: D.L. Pavia, G.M. Lampman, G.S.Kriz Jr., and R.G. Engel, Introduction to Organic Laboratory Techniques,A Microscale Approach, 4th edition – BU custom edition, W.B. Saunders, 2006.

Required Equipment:

To reduce the risk of eye injury approved goggles or safety glasses with side shields or must be worn AT ALL TIMES in lab (they will be provided during the class). Students ignoring this rule will receive a 10% reduction in their grade and then will be asked to leave the laboratory if the infraction continues. Contact lenses may **never** be worn in the lab due to safety hazards. Students should own their own safety glasses.

A lab coat is required. Closed-toe shoes, long pants, and long-sleeved shirts must be worn to lab. Your shirt and pants, or a lab coat, must cover you completely from neckline to shoes. Safety information in the text should be read prior to the first lab and the safety . **All work should be recorded in a laboratory notebook with consecutively numbered pages and the facility for making carbon copies.** Students are responsible for having copies of all work submitted.

Collaboration: Students are allowed and encouraged to talk about the laboratories together and to collaborate on understanding the material. **However, all work in preparing the pre-labs, observations and reports should be done individually**. No joint preparation of laboratory write-ups is allowed. Any student discovered copying from another student's lab, either past or present, will be taken before the academic conduct committee as will the student whose lab was being copied. Do not "help" other students by handing them your completed lab. You will be held responsible if they copy it.

Attendance: Punctuality is crucial as special instructions may be given at the start of lab. Attendance will be taken at the start of the lab. Lab is an integral part of the course. Anyone not completing the laboratory portion of the course will receive an incomplete in the course.

Grading: The laboratory grade comprises 25% of the overall course grade. The grade for each lab is usually based on 35 points for pre-lab preparation, 45 points for experimental skill and ability to record observations about the experiment and 20 points for post- lab reports to be submitted for each of six experiments. These percentages will sometimes change slightly if there are pre-lab rather than post-lab questions. Part of your skills grade will be based on results (e.g. ability to obtain product) and part will be based on your technique (adherence to safety rules, cleanliness and organizational skills) as assessed by your teaching fellow. The grade for the end-of-semester lab exam will count as much as one lab. Thus each student will have seven grades.

Make-up Labs: Students are expected to perform all experiments. In case of absences which may result from illness, or other serious reason, make-up labs might be arranged.

Lab Reports: COME TO LAB PREPARED!

Report Format: Lab reports consist of three sections: I. A **Pre-lab** to be recorded in the lab notebook **before** coming to lab. II. **Data and Observations** recorded while performing the experiment: III. **Results and Discussion** to be written (typed or in the lab notebook) after lab. Parts I and II will be turned in directly to the teaching fellow at the end of each lab session. Part III will be due one week later. Late reports will lose half credit for the report only.

I. Pre-Lab: In organic chemistry a critical part of the lab write-up is done before performing the experiment. The goal of advance preparation is to develop a good understanding of the required operations, a sense for their proper timing, and familiarity with the reactions, substances, and instruments involved. The Pre-Lab should include:

1) the **main reaction** under study (if any).
2) a list of **safety hazards** specific to the lab you are doing. ALL SAFETY HAZARDS SHOULD BE INCLUDED. Examples of hazards are flammable liquids, corrosive acids, and highly reactive materials. These hazards will often be mentioned in the lab text or on the prelab information sheet. However it is up to you to check on **all chemicals used**. Please describe hazards in your own words, do not include long printouts or xeroxes from books. The Merck index and MSDS sheets (available online) are helpful sources. Also note that goggles and gloves are precautions, not hazards. Use your own judgment. While ethanol is listed as being toxic (and can kill you), it is not a toxicity hazard in lab given that you can ingest more than you will be working with in lab without permanent harm. It is however a flammablility hazard.
3) a **separation and purification scheme (**if appropriate.) This is not the same as the procedure (see 4), but is an outline of where the reactants and products are (in solution, in the precipitate, etc.) Look at page 561 of the text- note that it does not include amounts or directions for the purification steps. You will need a separation and purification scheme for experiment one.
4) Instructions for the **experimental procedure** in your own words. Provide as much or as little detail as required so that **the lab can be executed exclusively from pre-lab notes.** Try to outline the procedure from the text. Do not simply rewrite the text. This procedure should include information on safety hazards and drawings of equipment needed. It should be written on the left half of the page. The right half will be used to record data and observations next to the appropriate step of the procedure.
5) **pre-lab questions** if assigned

The pre-lab should be complete enough that **it should not be necessary to refer to the lab text during lab**. The presence of the lab text on the lab bench will be taken as an indication of poor preparation and will result in grade reduction.

II. Data and Observations: A most important skill is the ability to record clearly the phenomena observed in the course of the experiment since these frequently are a sign of important chemical events. Examples of observations to be noted are color changes, the evolution of heat, the liberation of gas, the physical state and appearance of starting materials, intermediate reaction mixtures, and crude and purified products, etc. Set up your lab notebook so that observations can be recorded on the same page as the portion of the experimental procedure which is being observed. (see pre-lab item 4)
Data will be largely quantitative in nature and should be recorded with appropriate units. Examples include melting and boiling point ranges, quantities of materials used and products obtained, percent yields, reaction times, spectroscopic absorption maxima, Rf values, retention times, etc. All information should be recorded in your lab notebook.

Carbon Copies of all data and observations recorded in lab should be kept.

You will be handing in the **originals** to your tf at the end of every lab.

III. Calculations, Results and Discussion: It is a good practice to collect results neatly in tabular form. This is especially true if the raw data was recorded hastily or sloppily. The conclusion of the lab report should consist of a discussion of the major observations and results in terms of the chemistry involved. Your results should be compared to the expected results. What did you learn from doing this experiment? How do you know you produced the right product?

How have you shown it to be pure? What problems did you run into? If you synthesize or isolate a product you should always calculate percentage yield. This section of the lab should rarely exceed one page.

Any post-lab questions should also be included.

PRELAB LECTURE DATES

Prelab lectures will start on monday, September 3th, and will be held every two weeks.

CH 203 - LAB SCHEDULE - FALL 2013

Group & date	Title of Experiment	Experiment Number (pages refers to the 4th edition)	Techniques (pages refers to the 4th edition)
Lab 1, 9/5	**1.** Introduction - Isolation of an Analgesic From a Pill (acetaminophen)	Safety and Preparation Essay, p 67 **9,** p. 71	Tech. 1 and 2 p.1-13 (read only) & 542-73 Filtration, p.616-627 Melting point- sections 9.1 (p. 628) 9.2-9.5, 9.7
Lab 2, 9/19	**2**.Preparation of Acetaminophen (TLC test of purity)	**10,** p75 (microscale procedure)	Heating &Cooling p.589-94 Reaction Methods, p. 598-606, 612-613
Lab 3, 10/3	**3.** Isolation of Chlorophyll and Carotenoids from Spinach	Essay, p. 132 **16**, p. 136	TLC column chromatography, p. 756-777
Lab 4, 10/17	**4.** Synthesis of isopentyl acetate	Essay, p. 99 **13A**, p.104-105 (microscale procedure), IR, p. 107	reflux, p.600-604 distillation,p. 707-713 extraction and drying, p. 669-688 IR –Technique 25
Lab 5, 11/7	**5**. Spearmint and caraway oil (GC and polarimetry) and Synthesis of Soap	Essay p. 119 **15**, p.124-131 (Polarimetry and GC only) Essay page 243 **30**, p. 249	GC – Technique 22 Polarimetry handout – Technique 23
Lab 6, 11/21	**6.** Synthesis of Methyl Stearate	Essay p. 233 **25**, p. 239	IR, hydrogenation crystallization , p. 647-656

Be sure to read the relevant technique sections and the essays preceding the experimental procedure prior to coming to lab.

 # A lab exam will be held during week 49