The Electronic Lab Notebook (ELN) for Chem 269.

The reason for the ELN is to save you money! You now pay an almost $100 lab fee and Dr. McDaniel knows about financial difficulties. The no cost ELN saves you at least $20-$25 on a hardcopy notebook.

See the grading rubric posted on the course website. Your TA will use this as a template to grade your reports. Follow the pointers below:

1. Read the pre-lab example on the general handouts page of the course website.

2. For every experiment you will prepare a prelab and a post-lab. The pre-lab can be printed off, or you can bring your laptop, brought to your section for your TA's approval.

   a. The post-lab is uploaded as a pdf to Gradescope when it is complete (know the due dates).

3. There are post-lab report templates that are REQUIRED for you to use on the course website. There are two different templates, one for technique labs (experiments 1 – 5, and 10, which is the lab practical), and one for synthetic labs (experiments 6 - 9).

Prelab Entries Must Include:

- A heading which includes: your name, your TAs name, Date which work was performed, your lab section day and time and the title of experiment.
- A short description of the purpose of the experiment.
- A Balanced reaction (if applicable) using structural/skeletal formulas. Include side reactions and products.
- Table of reagents for the synthetic experiments. **This is not required for the technique experiments** as there are so many unknowns that it is simply too much work.
    - This should include molecular weight (MW), relevant physical properties such as melting point (MP), boiling point (BP), density, solubility information, **physical hazards**, and quantities used (moles, grams, milliliters). All physical properties are not always needed for all the compounds. For example, BPs are for liquids, MPs are for solids, densities are generally used for liquid reagents. Solvents and catalyst data should also be noted (e.g., BP, toxicity, density). Such information can be on Wikipedia.
- Prelab outline. This is the heart of the prelab preparation. It is a short version of the lab procedure, written in outline, bulleted form, **in your own words**. It is based on the experiment handout and information gained from the OWL prelab exercises. The purpose of the outline is to help you prepare for the experiment and carry it out in the lab. It is also very unsafe to work in an unprepared manner. Work will not be allowed until the TA has checked and accepted the prelab outline. If you come to lab without having an acceptable outline, you will be asked to leave and return only after you have an acceptable outline. The prelab is worth 5 points and you will receive an automatic 1/5 for the prelab if you come to lab with no outline. Also, you will unlikely have sufficient time to complete the experiment, leading to further loss of credit. Include safety and waste disposal instructions in the outline.

In-lab Entries.

As you work in the lab enter directly into the notebook, the actual procedure that you follow. As an alternate you can write these on a scratch piece of paper and copy into your ELN later. This will differ somewhat from the prelab outline. The prelab outline is what you expect to do. The in-lab entry is what you actually do. Measurements such as weighings, MPs, BPs, and chromatographic and spectroscopic

data should be entered as the data is determined. Careful observations should be noted ("the flask contents turned deep red, smoked profusely, and exploded, blowing a two foot hole in the lab bench.") The idea here is to provide as much detail as you can so that another worker could exactly reproduce what you did and get the same results. When you work in a research lab, this is extremely important so learn it and practice it here.

Before leaving the lab, clean up your workspace and any common workspaces that your TA may ask you to clean up, and make sure the TA signs the "ok to leave" next to your name on their roster.

Postlab Entries. Results, Discussion, Answers to Assigned Questions.

Calculate % recoveries (starting with compound X, doing an operation on it, and recovering compound X, what % did you recover?) and/or % yields (starting with compound X, carrying out a reaction, recovering compound Y, how much did you recover and how did that compare to the theoretical amount? Moles and stoichiometry needed.) Summarize results in an easy to read format (e.g., compound X, MP 101.5-103.5° C, 0.067 g obtained, 56% yield). Interpret spectra and chromatograms, write a brief (less than 1 page) conclusion, and answer any assigned questions.

In all cases, NEVER write in the first person. Instead of "I added xxx to a Erlenmeyer flask and I swirled it . . .," use "xxx was added to an Erlenmeyer flask and was swirled for 10 min in an ice bath."

A partial sample report for a synthetic experiment.

Name: John Connor

TAs Name: Connor Smith

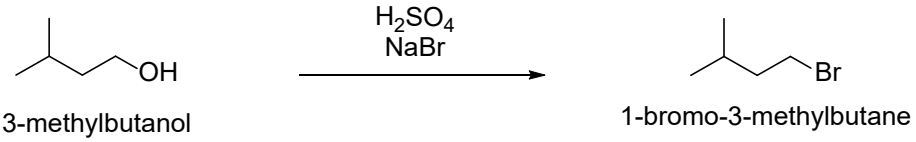
Experiment Date: 3/1/2016

Lab Section Day and Time: Monday, 1:25 PM

Title: Synthesis of 1-Bromo-3-methylbutane.

Purpose: The purpose of this experiment is to synthesize 1-bromo-3-methylbutane by an SN2 reaction of 3-methylbutanol with hydrobromic acid. The HBr *in situ* by reaction of sodium bromide with sulfuric acid. The product is purified by distillation and analyzed by gas chromatography (GC).

The Reaction:



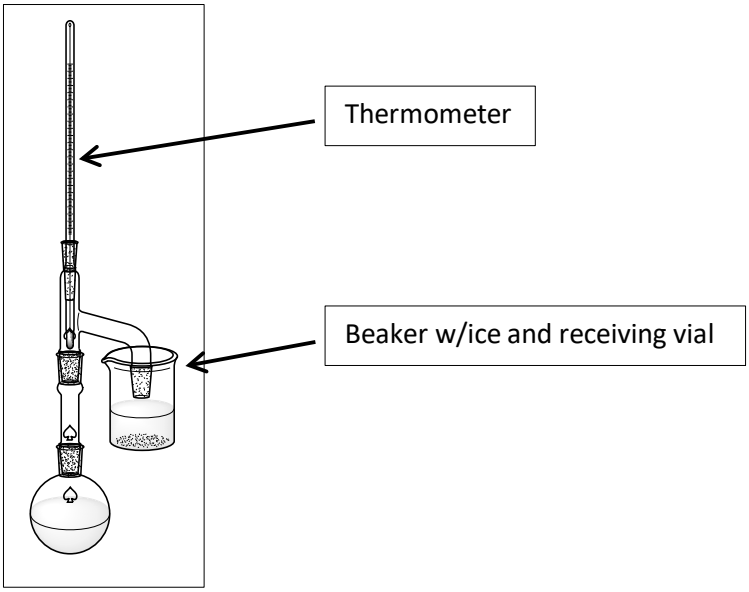
3-methylbutanol 1-bromo-3-methylbutane

Table of Reagents:

Compound	MW (g/mol)	Amount Needed	moles needed	BP	MP	Density	Hazards
3-methylbutanol	88.148 g/mol	0.90 g, 1.11 mL	0.0134	131.1 °C	--	0.8104 g/mL	None
NaBr	102.894	1.18 g	0.0115	--	--	--	--

Sulfuric Acid	98.079	1.07 mL	--	337 °C	--	1.84 g/mL	highly corrosive strong acid/oxidizer

Proposed Set-up



Outline:

- weigh 1.18 g NaBr into a 5 mL round-bottomed flask.

- add 0.90 g 3-methyl-1-butanol and 1 mL water to flask

(USE EXTREME CAUTION IN USING SULFURIC ACID)

- carefully add 1.07 mL (1.96 g) conc sulfuric acid with constant swirling.

-add a boiling chip

- connect distilling head and attach receiving vial.

- place receiving vial in 50 mL beaker containing ice-water. Beaker held in place with large three-pronged clamp.

- heat flask for 1 hr

-increase heat to distill crude product.

- (and so on and so on.)

- distill dried product into a clean, dry tared vial using a fractional distillation set-up (sketch set-up), collecting product over a temperature range of about 117-121°C.

- measure amount obtained

- carry out GC

- WASTE: place all liquid waste into the ORGANIC LIQUIDWASTE container in the fume hood.

In Lab Observations.

Actual mass of NaBr used: 1.180 g.

Actual amount of 3-methylbutanol used: 1.20 mL

Actual amount of sulfuric acid used: 1.10 mL

Upon addition of acid, the solution became quite warm. Solution remained colorless throughout reaction. Procedure from pre-lab/experiment handout was followed.

See "The Formal Report" handout on the website for results and discussion section and a properly written experiment procedure example.

Answers to Assigned Questions.