

## Formal Laboratory Report Guidelines

Chem 2062 Spring 2005

For some of the experiments you will be performing, you will write a formal laboratory report. Since many of the experiments in this lab will be performed in pairs, your laboratory reports will be written in pairs as well. Other labs may have individual or pair worksheets, mini-reports, or other documentation through the semester.

Reports must be typed double-spaced and normally will be turned in at the start of lab one week after the experiment is complete.

All chemical structures must be electronically drawn with ISIS/Draw, a free chemical structure drawing program. Hand-drawing chemical structures is not acceptable. You can download ISIS/Draw onto your home computer from <http://www.mdli.com> or use it on the laptop computers in the chemistry lab. There is an ISIS/Draw tutorial which was part of Anoka-Ramsey's Chem 1062 class available online at <http://webs.anokaramsey.edu/chemistry/Chem1062/Labs/WritingTools/>

Remember to back up your report! Save early and often, and send each revision to yourself and your partner by email. Floppy disks are unreliable and should be avoided.

The report will contain the following information, presented professionally. Much of this is duplication from your laboratory notebook, so careful preparation of your notebook before the experiment will save you time when writing the report. Reports are also easier to write while the experiment is still fresh in your mind, so don't procrastinate.

1. Title, names, date performed
2. Purpose, course of action, and hypothesis, all in *past tense*. Briefly describe what the problem was and how you went about solving it.
3. Balanced chemical equations for the reactions that were performed, drawn with ISIS/Draw. You may also be asked to draw a full arrow-pushing mechanism for the reaction as well.
4. Experimental citation *in proper format!* See Lehman p. 798 for format. Discuss *any* deviations you took from the experimental procedure. Do not summarize or copy the procedure in the report.
5. Reactant table with all appropriate information about quantities and properties of the reactants. Should include MW, mmols, concentrations, g, mL, d, mp, bp, solubilities as needed. Use only the *actual* amounts that you used in the experiment! (Take the readings from the balances etc and convert to mmols). Identify the limiting reagent if necessary.
6. Discuss any experimental observations that you noted in the laboratory. (Color changes, precipitations, product appearances especially)

7. Product table, including the theoretical yield, actual mass yields *and* percent yields, both crude and purified, if possible. Also any measured properties like mp or bp (include literature values for these as well, for comparison)
8. Any specialized calculations you used for the experiment should be included here, using the Equation Editor in Microsoft Word (not hand-drawn). It is *not* necessary to include yield or mole calculations, provided all of the required information is present in the reactant and product tables.
9. Tables of spectroscopic data. For IR, include wavenumber and bond type (2950  $\text{cm}^{-1}$ ,  $\text{sp}^3$  C–H str). For NMR, redraw the molecule in ISIS/Draw with each proton type labeled with a lowercase letter. Then in the table include proton letter, chemical shift, multiplicity, coupling constants if available, integration or #H, and proton type (proton a, 2.3 ppm, d, 7.0 Hz, 3H,  $\text{CH}_2\text{CO}$ )
10. An in-depth discussion of the experiment. This is the largest and most important part in the report. Your understanding of the experiment is exhibited in this section, so write it carefully. Write concisely, providing all necessary information without being wordy.

Start by re-stating the original problem in the experiment. Then answer that question and show how you arrived at that conclusion. Restate the percent yield here if applicable. Make sure to write in past-tense and passive voice.

Briefly discuss the chemical reaction and/or chemical concepts that were used in this experiment. Do not recap the entire procedure, but demonstrate that you understand the chemistry that was involved.

Restate any measurements that prove you have indeed created what you say you have (important spectroscopic data can be briefly discussed). Use this data to back up the claim you made earlier. Assess the purity if possible, citing specific values from your data (e.g. compare literature melting point with experimental, or discuss presence or absence of important impurity peaks on the IR or NMR spectrum).

You should also include discussions of anything that may have contributed to an imperfect result (especially regarding yield and purity), and explain how you would do the experiment differently to improve your results if you were to do it again.

11. Answer any questions assigned.
12. State any additional sources you used for the report.