**Lab Write-Ups**

Chem12AL, Organic Chemistry I Laboratory

Lab reports and the scientific papers they lead to compose the primary source of information for researchers and the body of work used to guide and elucidate further scientific inquiry. It is imperative that they are written both accurately and articulately so that their findings are recorded and can be understood by others. A careful recording of procedures and results also allows the researcher to track what worked and what did not and can be the source of discovery.

**BASIC GUIDELINES**

Write-ups are to be done in addition to the pages of questions included in the lab manual at the end of each experiment. They must be on separate paper, typed, and printed out before you come to lab.

Use clear, concise descriptions and exact language. It should be possible for another Chem12AL student to follow the procedures written in your lab notebook without needing help and be able to replicate your exact results. Use third person passive voice.

List all data *clearly*. It should be labeled with appropriate units and work, if necessary. Any spectra or other in-lab measurements should also be included.

**Each experiment should include the following sections:**

**TITLE:** This should be written at the top of the first page. It may be the same as the title in your lab manual. Immediately underneath should be your name, date, and lab section.

**ABSTRACT**: This should be a brief one or two sentence description of the goal of the experiment—what you intend to do, determine, or identify, what was found, and any major conclusions. For synthesis labs, this should include the overall reaction (the names of reactants AND products and the type of reaction), the percent yield or recovery, and how the product was identified.

**BACKGROUND:** This section should answer, “Why was this study performed?” and provide any background information and relevant studies that already exist on it. It should include a **minimum of three citations** to related studies in scholarly articles—the lab manual and textbook *do not count*. Do not directly quote these sources. Instead, summarize their results/conclusions in your own words. For synthesis labs, this should include a full description of the reaction including the structures of reactants and products, reaction conditions, any other experimental considerations, and any relevant mechanisms drawn out completely.

**PROCEDURE:** This is a stepwise description of what you did in lab, including all techniques, equipment, and procedures used. For experiments that have the procedure already written in the lab manual, you may write “Refer to Experiment # from the Chem12AL manual” in lieu of rewriting the procedure. If anything changed from the written procedure, be sure to include just those steps with what was actually performed.

**DATA**: This is where all of your data tables, calculations, and/or graphs should be located. Label everything appropriately (i.e., “Mass of Product Recovered” or “Equation 3” for sample calculations). For synthesis labs, record all exact masses, volumes, concentrations, pH’s, etc., of reactants used and products isolated. **Always** report percent yield/recovered when appropriate. For repeated calculations, it is only necessary to show one sample calculation. Any spectra or other computer-generated graphs should always be included and titled and numbered as figures (i.e., “Figure 1: IR Spectrum of Benzoic Acid”) and referenced in the text by their figure and number (i.e., “the alcoholic functional group was visible in Figure 1”). For IR, NMR, or GC spectra, the name and structure of the compound observed should always be drawn directly on the spectrum and any relevant signals labeled with their approximate numerical values and what they represent. The pages of spectra may be stapled at the end of each report.

* *Percent Yield* is reported whenever a reaction is performed and a new product is obtained. It is calculated as $percent yield = \frac{actual yield}{theoretical yield} × 100$
* *Percent Recovery* is reported whenever a compound is isolated from a mixture. It is NOT new. It is calculated as $percent recovery = \frac{amount recovered}{amount present} × 100$
* *Percent Error* is reported when a determined numerical value can be compared to a known true value. It is calculated as $percent error = \frac{actual-theoretical}{theoretical} × 100$

**DISCUSSION AND CONCLUSION:** This should be a prose-based interpretation of your data including any possible errors that may have affected your results. Avoid restating results; instead, explain the logic that leads to your conclusions. Be sure to reference *every* figure included in your Data section to explain what they indicate about your results (Pure? Impure? What functional groups were present and why do you know this? Did the reaction go to completion or not? Was there solvent in your sample?) Include suggestions for improving your techniques or experimental design.

*Note*: Lab report writing is an essential skill that will be assumed to be in your possession as you continue in scientific courses, research, or professional laboratories. It protects yourself by providing a verifiable record of your work as well as creates a physical record of methods tried and tested for others to follow. It is an invaluable thing to learn and to always practice!