

# UNIVERSITY OF MASSACHUSETTS BOSTON

## CHEMISTRY DEPARTMENT

### Physical Chemistry Structure Laboratory

#### Lab Report Guidelines

Here are some more guidelines for your lab reports, in addition to those presented in your text. Remember that your goal is to emulate the style and form of articles published in the scientific literature, not to reproduce the format of high school chemistry reports. Your lab reports for this class should consist of the following parts:

- A **Title Page** for the experiment, including the **date** your report was submitted, your **name** and the names of any other students with whom you worked on the experiment.
- An **Abstract** detailing the goals of the experiment, the methods used to obtain those goals, and any numerical results which can be presented without further explanation. The abstract should be no longer than 4 or 5 sentences. **Anything given in the abstract must appear in more detail in the body of the report.**
- An **Introduction** describing the **theory** behind the experiment, and explaining the goals laid out in the abstract. The introduction should include information which was known before the experiment itself was conducted. **Do not** simply reproduce the information provided in the handouts or the text: your introduction does not need to go into that level of detail. State the problem in your own words, and the means by which the problem will be solved. Be careful with your verb tenses. What you **did** should be presented in past tense, preferably in the passive voice. What the underlying theory **is** should be written in the present tense.
- A section detailing the **Apparatus and Procedure** used in the experiment. List the spectroscopic components that make up the instrument. Summarize the procedure in a few sentences, leaving out details such as which knobs were turned or what the voltage to the detector may have been. Assume that the reader knows how to conduct most simple experiments in spectroscopy, and your job is simply to explain which experiment you performed. Indicate how many measurements were performed, the measurement conditions (if not specified in the instructions), any unusual events that occurred during the measurements that might have affected the results.
- A section which presents your raw **Data**, including any data from other groups which you used to obtain an average. It is often convenient to attach these plots at the end of the lab report as an appendix. If this is done, state that fact in your data section. Use tables and graphs as appropriate.
  - a. Tables - Give a title to every table (e.g., " $1/n^2$  vs. frequency data for the Balmer Series") and clearly label all columns, including the units being quoted. Do not break tables across pages.

b. Graphs - All graphs should be prepared using a suitable graphing program. Data points should be evident and the best line or curve drawn through the points should be given. In cases of data that should describe a straight line, apply a linear least-squares regression routine and quote the values of the slope, intercept, and correlation coefficient (or residuals). If the data are fit to a nonlinear curve, the nature of the curve (exponential, polynomial, etc.) should be stated and the best-fit equation given.

- An **Analysis** of the raw data, including the formulae used for any nontrivial calculation. Unit conversions and data averages are trivial, while theoretical band structures, for example, are nontrivial.
- A section summarizing the **Results** of your experiment. Note that this section can often be combined with the data and analysis sections, particularly if the calculations are all simple. Tables and graphs are both appropriate formats, and should be given clear titles and column or axis labels as applicable.
- A **Discussion** of your results. In writing this section, consider answering the following questions: What did you learn? Did the system behave as expected? How well do your numbers match up with known physical constants? In addition to these questions, include in the discussion answers to any questions which were presented in the lab procedure itself. **Do not** separate the questions from the rest of the text with numbers or bullet points; these answers should flow naturally from the thought processes used to describe how your results fit in to the physical models used in the course. You should also always include an error analysis – not just how well do your numbers agree with theory, but where and why do they differ? Be as quantitative as possible, although this may be difficult for some experiments.
- A list of any **References** used in preparing the report. Any formulae and physical constants not considered general knowledge should be cited, as should any ideas which are not your own. These sources will generally include any handouts you used to prepare for the lab, your textbook, and the lecture immediately preceding the lab, among others.

If you have any further questions about the writing of lab reports, feel free to contact me and discuss them.