

Physical Chemistry Lab Reports

First, a few general remarks: (1) Make every effort to keep up with your work – do not fall behind. The best time to do your report is right after you completed the lab. This is the time when everything you did is still fresh in your mind. Many problems can be resolved quickly with some help if you attend to them soon. Reports begun the night before they are due rarely earn a high grade. (2) You are responsible for what you hand in. The work included should be yours. (3) You are responsible for proofing the accuracy of all data and analysis reported. So-called “software errors” are no excuse for incorrect information in your report. (4) The report should be a concise account of the work that you did. It should be structured logically and include the following sections: Title page, Abstract, Introduction, Experimental procedure, Results, Discussion, References, Appendix (as necessary). The following general format should be used in writing your laboratory reports:

1) Title page - This should include your name, the names of any lab partners, the title of the experiment, the course number, and the date.

2) Abstract - A short summary of the objectives, main results, and conclusions for the experiment. Succinctly describe the outcomes/results of your experiment and emphasize the most significant and interesting findings. This section should be limited to one concise paragraph in length.

3) Introduction - A short summary of the objectives of the experiment, including what is being measured and how it is being measured. Briefly outline the background surrounding the work you performed. You should be able to convey to the reader the context of the experiment(s), the expected outcomes, and any of the scientific background that is necessary to understand these. This should include explanations, or derivations of any pertinent theories, equations, effects, and laws. We are not looking for you to simply regurgitate the introductory material presented in the lab handout in your introduction to the lab report (you can, in fact, cite the lab manual as a reference). Instead, give enough information that the reader can follow your work and understand your presentation of data, your analysis of data, and the conclusions that you draw.

4) Experimental procedure - An outline of the procedure used to carry out experimental measurements. If the procedure used is as given in the lab handout, then you can refer to the handout and do not have to give a discussion of the experimental procedure in the report. If there are any differences between the procedure in the lab handout and that used by you in the experiment, they should be discussed in detail. This section should provide the reader with specific information regarding what you did that may not be explicitly stated in the manual, or, any variations from the prescribed procedure.

5) Results - In this section you should give the primary experimental data and the details and results of any calculations carried out on the data. Organization is important here. Data and results should be presented in as clear, concise, and meaningful a form as possible (data tables, plots of experimental data, etc.). Error estimates for the results should also be discussed in this section of the report, using the principles outlined in the handout on error analysis. An effort should be made to tabulate and display your data in a meaningful way. This includes consolidating tables and plots to remove redundancies, and to more clearly illustrate trends with your data and between sets of data. You want the reader to clearly understand the implications of your results and conclusions through the way your data are presented. This includes, for example, using reasonable scales to display your data. Be sure to include a figure caption below the plot that describes what the plot is illustrating. This should not necessarily be a simple statement that it is a plot of x vs. y , but rather should describe the bigger picture of what the plot depicts (FT-IR spectra of XXX...). When possible, include error bars. Go beyond your ‘raw’ data, where reasonable. For example, a plot of absorbance vs. time is less meaningful than a plot of concentration vs. time. For tables, be sure to include a meaningful caption above the table that describes why the data included are of interest. Many of the data sets collected in these labs can be combined to make overlay plots to highlight a trend between sets, or efficiently compile a table such that pertinent data are presented.

6) Discussion - This section is the most important part of your lab report. This is where you interpret your data. Think about the objective of the experiment before writing up the discussion. Results from the experiment should be compared, if possible, to literature and/or theoretical values. This does not only mean to explain how close (or far)

your results are from accepted values. If possible, the major sources of experimental error should be identified, and their effect on the experimental results discussed. You should make an effort to explain why your results may be different. This interpretation should not rely only on error analysis. Perhaps there are assumptions that have been made which were incorrect. You should also discuss the results of your data in the broader picture of what it adds to the scientific community. Any questions posed in the lab handout should be answered at the end of this section of the report, along with any suggestions for improving the experiment. You need to demonstrate that you understand the significance of your results. It is not enough to simply state the end result, or the single value that you feel may summarize your work. This is the place to spend some time and effort. This proves to the reader that you have thought about what you are doing in detail, and have achieved a high level of understanding, and your grade will reflect this. In the end, this section should succinctly summarize your conclusions based on examination of the data. Be sure to explain the implications of your data, and what this means for the scientific community. If this were a paper on new research, this would be where you have the opportunity to help guide the next set of researchers if they were to continue your work. It is good practice to write the report as if this were the situation.

7) References - All outside references used in the report should be indicated by a reference number in the body of the report and listed in this section of the report. The correct procedure for doing this can be seen by examination of any of the experimental lab handouts. List any sources of information. These can be journals and textbooks. Students are encouraged to examine the literature to identify reasonable references as these will lend themselves to facilitating your discussion. One example would be to use SciFinder to locate journal articles pertinent to the work you have completed.

8) Appendix (as necessary) - Include your 'raw data' and calculations in this section. Any tables and figures in this section should be referenced in the text, but, if possible, not duplicated.

Remember that though you will be doing the experiments with lab partners, the lab reports are to be done individually. Copying from the lab report of another student is considered plagiarism and will be punished accordingly.

A sample lab report is given in a separate file and can be used as a model for your lab reports.