

# PHYSICAL CHEMISTRY LABORATORY

## **General Comments:**

The laboratory section of this course is composed of five experiments and two computer exercises. These have been selected:

1. to illustrate and reinforce principles taught in the lecture section of the course;
2. to provide training in the techniques of experimental physical chemistry and sophisticated data analysis;
3. to provide training in the writing and presenting of laboratory reports.

Experimental instructions will be given as a selection of handouts.

## **Lab Partners:**

All experiments will be performed in teams of two or three. Lab partners will be assigned and they will change with every lab. Although it may be common practice for lab partners to consult with each other in the calculation of the results, students are responsible for preparing and submitting their own reports.

## **Lab Reports:**

Most of the laboratory reports will be submitted in written form but at least one is to be given as an oral report. The formats of the written and oral reports are to be identical. A description of what should be included in each section can be found on the back of this sheet. The importance attached to each section of the report is as follow:

Abstract	10 points
Theory	20 points
Procedure	5 points
Results	10 points
Discussion	20 points
Conclusion	5 points
Overall neatness, organization and clarity of expression (including proper grammar)	15 points
Accuracy of experimental results	15 points

The report should be typed on standard 8½ x 11 inch white paper. A title page should include the title of the experiment, the student's name, the name of the lab partner and the due date of the report. All equations presented in the report should be numbered consecutively and all symbols should be defined where they first occur. Except for commonly accepted equations, references should be given for any information taken from the scientific literature. All references should be consecutively numbered throughout the report by superscripts, and presented in acceptable form at the end of the report in a section titled "References."

The following is intended as a guide for students in preparing physical chemistry laboratory reports. The report should be divided into the following sections with each being clearly distinct from the others.

1. **ABSTRACT** — Be sure you understand the entire experiment before you begin writing, then summarize the purpose of the experiment, and your purpose for doing it, in clear and concise terms. State what it was you were trying to accomplish and then in a sentence or two **summarize your findings**. This whole section should be no more than one or two paragraphs.
2. **THEORY** — Clearly state which physico-chemical principles enable you to obtain the desired results from the data you collected (i.e., what laws or equations relate to the quantities you are to report?). Give specific derivations which lead to the equations you use. Clearly state all assumptions made in deriving these equations. Also explain the principles behind the operation of any special apparatus used in the experiment.
3. **EXPERIMENTAL PROCEDURE** — Give a clear, step-by-step account of the procedure so that someone else would have little difficulty visualizing the experiment. It is sometimes useful to include a sketch of the experimental set-up in this section. Make particular note of any variation in the prescribed experimental procedure which you found helpful.
4. **RESULTS AND CALCULATIONS** — Tabulate all results in a clear fashion. Whenever possible, include "accepted" literature values and give the deviation of your experimental values from the accepted values. Include one sample calculation for each type of computation used in calculating your results. The data should be well organized so that the reader can easily follow the progression from measured values to computed results. Be sure to include all units. Be especially attentive to significant figures. (Don't claim more precision than your measurements actually give.)
5. **DISCUSSION OF EXPERIMENTAL RESULTS** — Discuss your results. Include graphs, when appropriate, to reinforce points in your discussion. Be sure that all graphs have a title and caption and that each axis is clearly identified. If the deviations between experimental and accepted results are larger than should be expected for the apparatus used in the experiment, then you will need to include sufficient error analysis to show the exact cause of the deviation. You should list the sources and magnitude of expected errors and their influence on your results. Don't neglect errors associated with assumptions made in the derivation of equations in the theory section. Include what you know about systematic errors which are inherent in the measurements. Finally, state briefly how you think the experiment might be improved.
6. **CONCLUSION** — This should be a brief summary of the most important points mentioned in the previous sections of the report. Explain how the results fit with your purpose in doing the experiment. Mention any other application you can think of for the apparatus or techniques used in this experiment.
7. **REFERENCES** — Finally, give credit to any external sources of information used in preparing your report. Use an appropriate bibliographic format.