

INFORMATION ON LAB REPORTS

LAB REPORT CONTENT

The material to be included in the lab report is specified in the writeup for each experiment. Lab reports normally consist of data sheets, computer printouts, raw and worked-up data (including tables and graphs), duplicate laboratory notebook pages, answers to questions posed in manual, and an abstract (except for Experiment 1). The abstract should be written in the 3rd person (The absorbance was determined... not, We determined the absorbance). Do not include section parts (e.g., In part IV, ...) in the abstract. A sample abstract can be found on the course web page.

WHAT YOU MUST WRITE FOR YOUR LAB REPORT

Everybody must turn in his or her **own** report. You can initially work together as a team in checking the raw data you collected as a team in the laboratory. **However, each of you is required to turn in your own individual data sheets, your own answers to the questions in your own words, and your own spreadsheets, tables, and graphs.** Every student should do his or her **own** computer entry and plotting of data. **Penalty for plagiarism on reports:**

If members in a given team turn in reports in which the answers are essentially the same and/or the spreadsheets and/or graphs are identical in every detail, the grade for all students in that team will be lowered one grade level. Of course, photocopied or multiple printouts of the same file are not acceptable.

Each team is required to turn in only one set of original raw data from instruments that produce only one copy (e.g., instrument charts, dated and properly labeled) unless otherwise stated in the lab manual. If such original data are not attached to your own report, be sure and indicate on the Data Sheet you turn in, who in your team has the original data with their report, or make your own photocopy of original raw data from instruments. **Do not turn in the laboratory manual.**

Abstracts and discussion sections of the report should be done in a wordprocessor. It is quite satisfactory to leave spaces to write in equations or calculations because these are time consuming to type. You are not required to type extensive equations and sample calculations. Do not retype your laboratory notebook verbatim.

PLOTTING OF DATA

In most experiments, X-Y type data will be obtained such as signal versus concentration. In most cases, you should use a spreadsheet to organize the data, plot the data, and fit the data. You have use of the computers in rooms GBAD 311 & 313 that have Excel used to fit data by least squares routines and to plot the data with output on a printer..

ADDITIONAL DETAILS ABOUT LABORATORY DATA

A) Labeling of Graphs/Charts

Charts will be done in Excel and printed to turn in with your report. Much of your data will be in the XY format (e.g., voltage vs concentration; voltage vs wavelength) in a spreadsheet. The idea is to have enough information recorded in your notebook and on the chart so that someone else could interpret your data correctly and could go into the lab and reproduce your work. Each chart is considered a Figure and should be numbered and include the following minimum information:

- 1) Label axes: name of variable and give the specific units (e.g., mV, A, s).
- 2) If more than one set of data are plotted on same graph, use different symbols (markers) to distinguish points in one set from the other.
- 3) A caption that includes a Title or description (e.g., scan of Hg lamp), experiment number. Don't repeat axes labels for the title; use a descriptive title like "Calibration curve for ..." .
- 4) **In all cases where curve fitting is used, write down the equation for the curve** in the report and limit the number of significant figures in the coefficients to appropriate values. For example for linear fits, report the slope and the intercept and use these values to find the analyte concentration in the unknowns, e.g.,
$$y = mx + b \quad \text{or} \quad A = 2.08 c - 0.11$$
Some spreadsheets do this automatically (e.g., trendline in Excel).
- 5) **Each chart that shows curve fitting must include a text box giving the fitted calibration equation and coefficients plus error estimates for each coefficient.** The standard error in the slope and the standard error in the intercept are good error estimates for these coefficients and should also be included. The standard errors (se 's) are obtained from running least squares analysis or using the LINEST array function in excel.

If the chart is a spectral scan, the following additional information should be given:

- 6) Monochromator scan rate (nm/min)
- 7) Monochromator entrance and exit slit widths (μm)
- 8) Start and stop wavelength
- 9) Type of detector (e.g., PD, PMT, or CCD); for the PMT include the bias voltage and module gain setting; for the CCD include the integration time, number of averages, level of boxcar averaging.
- 10) If used, note the signal conditioner gain setting and cutoff frequency for the filter
- 11) Remarks about unusual conditions (e.g., voltage drifting, scan problems)

B) Units and Significant Figures

All reported numbers should have units and the proper number of significant figures.

Particularly watch significant figures when using the digital multimeter (DMM) or the computer (e.g., spreadsheet may report calculations to 9 or more digits unless you change the format).

C) Answers to Questions and Calculations

Answer all questions given in the laboratory handout with enough detail and description that it is clear that you understand the answer (short sentences preferred). Be sure to show example calculations where appropriate or called for. Do not restate the question. Answers to the questions posed in the lab manual for the report should be listed in the order given in the laboratory handout. That is, list your answers using the same numbering system used for the questions in the laboratory instructions, and in the same order. Always include units where applicable.

D) Data Sheets

If you believe the Data Sheet you filled out in lab is too messy, you may print a new data sheet from the course web site and copy your results to it. However, you must attach the original data sheet as it is effectively your "laboratory notebook" for some data. **Always include duplicate pages from your own laboratory notebook for experiments 2 - 6.**