

DEPARTMENT OF CHEMICAL ENGINEERING
University of California, Santa Barbara

ChE 152B

Winter, 2010

Guidelines for Writing Laboratory Memoranda

A. Format

1. Use the standard memo format shown below:

Date

To: _____

From: _____ (Include both group number and names of group members)

Re: _____ (Include experiment number)

2. Use three or four subdivisions within the memo ordered as follows:

Introduction
Conclusions and Recommendations
Discussion

3. Major headings should appear in boldface or capital letters.
4. A maximum of four figures and/or tables should be attached to the memo. Each figure should be cited in the text by number (e.g., "... as shown Figure 2") and placed following the text. Very short tables of information (three or four lines) may be embedded in the text. Figures and tables should be used sparingly and only when they convey specific information important to make convincing arguments or to illustrate particular points. They should not be included merely to document results.
5. Whenever possible, refer to information in previous memoranda specifically rather than repeating this material. For example: "We utilized the equipment shown in Figure 1 of our January 23, 2010 memo."
6. Ordinarily, the Introduction section should consist of one or two short paragraphs that: (1) indicate the motivation for the work described in the memo, (2) briefly describe the general approach that was taken. Figures and tables should not be cited in this section.
7. The Conclusions section should summarize the key results of the memo in one or two short paragraphs. Brief, direct answers to any specific questions in the lab handout should be given here. Some very brief argumentation is appropriate to indicate the basis for your stated conclusions or to convince the reader that your methodology was appropriate. However, detailed arguments and discussion should be deferred until the Discussion section. Figures and tables should not be cited in this section.

8. The Discussion section should consist of a maximum of 1 to 1-1/2 pages (typed) covering the following topics without subdivision headings:
 - a. Experimental procedure
 - b. Methods of analysis
 - c. Specific results (experimental and analytical)
 - d. Discussion of results

The key objective in this section is to briefly present all the arguments required to substantiate your earlier Conclusions and Recommendations.

9. All citations to figures and tables should appear in the Discussion section. The one exception is that sometimes a small table of information embedded within the text of the Introduction or Conclusions helps make a set of results more understandable. (See D.5)

Example:

Recommended Controller Settings

PI Control

PID Control

Tank 1

Tank 2

10. The memo should be typed with the pages numbered.
11. All material that is part of the memo should be stapled together.

B. Style

1. Because the memo usually is addressed to an individual, it should read much like a personal communication. It also should be brief and to the point.
2. Occasional use of first person plural (i.e., we, our) is acceptable, even desirable, especially when expressing a personal opinion or making a recommendation.
3. Despite the recommendation in B.2, avoid starting every sentence with "we". Use an occasional passive constructions for variety. However, note that a simple declarative, "The results showed", is much better than, "It was shown".
4. Good writing "flows". Put together a first draft. Read it over later and rewrite it until each sentence is necessary, in the "right place", convincing, and leads into the following sentence.

C. Logic

1. A memo should convey a complete message logically and forcefully. In addition, each major division should make the point(s) appropriate for that section. For example, the Introduction should provide the reader with a clear understanding of why the memo was written and what it is about.
2. Logical constructions should be made as required. For example: modeling results can be used to answer questions that cannot be answered by experiment; however, you first should show that the model is suitably accurate.
3. A *non sequitur* is an inference or a conclusion that logically is out of place. These usually indicate that you have not thought through the development of your message. Eliminate them by rewriting after rethinking.

D. Tables

1. Tables should be used sparingly to present data that are too numerous or complex to be placed in the text. A figure, if appropriate, always gets the message across more effectively.
2. Never include extensive raw data in a memo in tabular form. Either plot the data, perform a statistical analysis, or summarize the data in some fashion.
3. A process model usually is too detailed to be of much importance in a memo; one should only be included if you have to make specific reference to the model equations.
4. Each table should be numbered (e.g., Table 2) and cited in the text.
5. Tables should be placed in order at the end of the memo unless they are small; in this case, they can be placed in the text (see A.9).
6. Each table should have a descriptive title. The table number and title should appear above the table.

Example:

Table 1. Controller Settings for the Level Control Loops.

7. A caption or heading should be used for each column of data in a table. Besides identifying the contents of that column, the heading should indicate the units, if appropriate.

E. Figures

1. Figures should be used sparingly to present data that have some visual message content. Only in unusual circumstances should more than two or three figures be included in a memo.
2. The experimental and simulated response data should be plotted using a standard computer software package.
3. Each figure should be numbered and cited by number in the text.
4. Figures should be cited in order of appearance and placed in order at the end of the memo.
5. Each figure should have a descriptive title, instead of only indicating the variables that are plotted, e.g., “y vs. t”. The figure number and title should appear below the figure.

Example:

Figure 1. Liquid Level Responses to a Rectangular Pulse Input of Six Minute Duration.

6. Some additional guidelines for figures:
 - a. Select scales for the axes so that available space is used effectively.
 - b. Label each axis with a symbol and its units.
 - c. Show each experimental data point by means of a symbol (o, Δ , etc.). Connect these symbols by line segments or a curve, only if a theoretical model result is not plotted.
 - d. If a theoretical model result is shown on a plot, use a solid (—) or dashed (---) line. Do not show individual calculated values for this line by means of symbols such as those used for experimental data.
 - e. The variables being plotted should be identified either in a legend or in the figure caption.

Example of a Legend:

Δ	h_1 (experimental)
\square	h_2 (experimental)
—	h_1 (model)

Note that the objective of items (c), (d), and (e) is to give your plots a clean, uncluttered look and to help the reader interpret immediately what is being displayed. The gaps

between model and data will make apparent the discrepancy between theory and experimental results.

7. Often, by judicious choice of scales, several sets of results can be plotted in the same figure. Do this in order to minimize the total number of figures so long as the results do not become confused.

F. Nitpicking

1. The word "data" is plural. Example: "These data are hardly worth reporting" is correct but "This data is excellent" is incorrect. Use "datum" or "data point" for the singular.
2. Each sentence should have a subject and a verb. They should agree in person and in number.
3. No one can spell perfectly. Use a spell checker or dictionary.
4. Pay special attention to significant figures. If you can only read raw data to the nearest tenth of a unit, or if your model is only that precise, do not report results any more precisely. Remember that 1.004 represent *four* significant figures; 0.004 represents only *one* significant figure.
5. Numbers between one and ten are normally spelled out.
6. If you include a result as a percentage, state what the basis is. "The results were accurate to 5%" is meaningless. Note that using a relative point of reference usually is also meaningless. In both cases the percent error changes. For process dynamic and control experimental results, it usually makes more sense to use a change between two steady-state values as a reference (or use a maximum change during a transient response). For example: "The predicted pulse response matched the observed response within 5%, based on the maximum change in the experimental response".
7. Do not make references to the personal file in the memorandum. "See personal file for details" is about as useful as telling someone to rummage through your desk for the information. The memo should stand on its own merits; if you have to refer to something in the file, then it probably should be in the memo.