

CHEMICAL ENGINEERING LABORATORY

LONG REPORT OUTLINE

- i. Cover Page
- ii. Presentation Letter
- iii. Contents
- iv. Summary
- 1. Theory
- 2. Experimental Method
- 3. Results and Discussion
- 4. Conclusion
- 5. Nomenclature
- 6. References
- 7. Appendix

CHEMICAL ENGINEERING LABORATORY

SHORT REPORT OUTLINE

- i. Cover Page
- ii. Summary
- 1. Experimental Method
- 2. Results and Discussion
- 3. Conclusion
- 4. References
- 5. Appendix

The report used to present the results of an experiment should, in general, follow the style of the formal engineering report given below.

COVER PAGE

The cover page should contain:

- The name and number of the experiment,
- The date when the experiment was run,
- The number of the group,
- The names and ID numbers of group members,
- The name of the assistant to whom the report is submitted,
- The date of submission of report.

PRESENTATION LETTER

This letter in a page, should be written to the supervisor of laboratory in official form. The name and the date of the experiment, the objects and the important results of the experiment and the limiting conditions are given in this letter. All group members should sign the letter.

Presentation letter can be written as follows:

Dear [Your Supervisor's Name],

[Begin with an introduction to your report. Write the name and the date of the experiment, the objects and the important results of the experiment and the limiting conditions. State its contents clearly. Give the purpose and significance of your work. If you conducted a complex experiment, indicate the scope and limitations.]

[In a second paragraph, acknowledge the assistance of those who contributed to your work. Also give the total effort of your team members, plus other items specified by your assistant.]

Group members names and signitures.

CONTENTS

The titles of sections and subsections with corresponding page numbers should be given as a list. Contents section should include:

- List of Sections,
- List of Figures,
- List of Tables.

SUMMARY

This section should contain:

- objects of the experiment,
- characteristic of the equipment used,
- experimental conditions and parameters,
- main results and conclusion.

The above items should be covered with in the text of the “summary”, using a few short sentences for each, without any subheadings. Do not include illustrations. Make sure the abstract is self-contained and that it includes no information or conclusion not stated in the report. Keep the length to 275-450 words.

BODY OF THE REPORT

1. THEORY

The theory underlying the unit operation or process should be discussed briefly. A derivation may be made if not too lengthy and all questions used later in the calculations should be presented here and numbered so they may be referred to later.

The symbols and nomenclature should be described with equations using them.

Shortly, the theory section should include:

- the theory of the experiment,
- the equations which are used to acquire a certain result,
- a derivation of an important equation (if not too lengthy) and
- theoretical correlations (which are used for comparison with experimental results)

2. EXPERIMENTAL METHOD

2.1. The aim of the experiment

This section should include few sentences describing the aim of the experiment.

2.2. Description of the apparatus

The description of the apparatus can be shortened and clarified by the use of sketches and photographs. All unusual features of the apparatus should be described,

particularly if they limit the test results in any way. It should be noted whether the instruments used for the tests are unusual or limit the data.

2.3 Experimental procedure

The experimental procedure should be described concisely, particularly any feature that may limit the results.

Shortly, procedure section should include:

- the ranges of the operational variables, such as temperature, pressure, flow and others,
- a brief description of the actual step-by-step procedure you followed in running the experiment (It should be written in your own words),
- detailed explanations on the modifications or operating conditions that limit the results.

3. RESULTS AND DISCUSSION

The results should be presented in figures or tables. Tabular or graphical form which is desirable whenever possible. Such graphs might also show the theoretical curve or results presented in literature by some previous worker.

The heart of the report is the discussion of the results. It should tie the actual results with the theory developed initially. Keep qualitative statements to a minimum and give exact figures wherever possible.

Results and discussion section should give answers to these questions:

- What data are presented?
- How were the data analyzed?
- Why the data were plotted as they were and what the line means?
- Why don't the data agree with the theory?
- What assumptions were made in deriving the theory that might show up here?
- What are the possible experimental errors, their magnitude and correction?
- What results do the other workers report in the chemical engineering literature?

4. CONCLUSION

This final section re-presents the conclusions so they are accessible to someone reading quickly. The conclusions may be a series of numbered statements with the individual conclusions drawn from the experimental results.

Recommendation for changes in construction, experimental method, or other factors, may be presented with the conclusions if both are brief. If they are lengthy, or if the object of the work is to present recommendations concerning the equipment, operation or process, they should be made a separate section.

The conclusions section answers these questions:

- What were the tasks?
- What were the most important conclusions developed from each task?
- What are the most important recommendations for equipment and procedure?

5. NOMENCLATURE

The nomenclature used through out the report should be collected on a separate sheet just before the literature cited. The symbols are arranged in alphabetical order, first Roman letters, followed by Greek letters and then special symbols. The units in which each is expressed should be stated.

$\dot{m}$: Mass flow rate, kg/s

P: Pressure, Pa

Δ : Wall thickness, m

μ : Absolute viscosity, Pa.s

6. REFERENCES

All references to books, web sources etc. must be given at this section of the report. They should be numbered in sequence starting at the beginning of the paper. The numbers should appear in the text at the appropriate places as shown below.

Example: "..... as demonstrated^{1,2} . "

The rules on the writing of references are as follows:

Books:

Names of author, "Title of Book" (within quotation marks), Edition (if not the first), Pages quoted, Publisher, Place of publication, Year of publication.

- R.E. Treybal, "Mass-Transfer Operations", 3rd ed., pp. 35-37, McGraw Hill, Singapore, 1988.

Journals:

Names of author, Name of periodical, Volume, Pages, (year).

- Silverman, L., Bradshaw, W., Ind. Eng. Chem., 48, 1242-1247 (1956)

Patents:

Inventor (and assignee, if desired), Title of the Patent, Country of issue, Number of the patent, (Date of issue)

- Standard Francaise des Petroles, Lubricants, French Patent 991724 (Oct. 9. 1951)

Web references

Archival references are preferred, but if web references must be used, the full URL should be given and the date when the reference was last accessed.

7. APPENDIX

7.1. Appendix 1. Original data sheets

7.2. Appendix 2. Calibration curves

7.3. Appendix 3. Sample calculations (HAND WRITTEN)

7.4. Appendix 4. Development of equations

7.5. Appendix 5. Other technical documents

GENERAL GUIDELINES FOR FIGURES AND TABLES

Presentation and Numbering

1. Identify all illustrations as either tables or figures. Do not use the words “chart,” “exhibit,” “graph,” or “photo,” when naming a specific figure.
2. Always place the illustration as close as possible to the text that describes it. Place the explanatory text first and the illustration second.
3. Keep all illustrations consistent in font size, typeface, symbol size, and line weight.
4. Place figure numbers and captions directly below figures. Place table numbers and titles directly above tables. Use Arabic numbers to label both figures and tables (Figure 1, Figure 2, etc; Table 1, Table 2, etc.).
5. Whenever you refer your reader to a figure in the text portion of your paper, the word “Figure” should be capitalized and abbreviated, e.g., “see Fig. 6.” The word “Table” is also capitalized, but not abbreviated, e.g., “see Table 7.”
6. Make sure you integrate the illustration with the textual discussion. Refer to each illustration in the text by saying, “see Fig. 1” or “see Table 1”). In the text, give directions for reading and interpreting the data. Draw conclusions about the illustration. Do not expect your reader to look at the illustration and draw the same conclusions that you did.

Captions

1. Each illustration must have a number and a caption. Number the figures and tables consecutively throughout the text. Keep the information as brief and simple as possible. Figures and tables are numbered separately. Therefore, Table 5 could appear in a document after Figure 20.

When illustrations are less important to your explanation, they may be located in an Appendix. In this case, they are numbered as Figure A-1, Figure A-2, etc.

2. The caption should be understandable without reference to the text. At the same time, make sure that the wording in the caption is consistent with the wording of the text. Never add new ideas or new interpretations to the caption.
3. List data sources or references for your figures in the caption of your illustration: (Bureau of the Census, 1990). If you need to modify the original illustration, indicate that you have done so: (Bureau of the Census, 1990, modified by the authors).

4. Both figures and tables should be listed as they occur in the Table of Contents section of your report. Make sure that your captions and page numbers correctly correspond to those listed in your Table of Contents.

GENERAL GUIDELINES FOR WRITING EQUATIONS and FORMULAS

1. Center each equation or formula on a separate line.
2. If more than one line in length, the equation should be broken at the end of a unit, as before a plus or minus sign.
3. Place all of the equation on a single page.
4. Allow two lines above and below the equation.
5. Use no punctuation after the equation if it appears at the end of a sentence; however, it is permissible (and may even be necessary) to place some form of punctuation after it (a comma or semi-colon, for example) if it appears in the middle of the sentence and is followed by text. In any case, maintain the coherence of all sentences with equations in them.
6. Number the equations consecutively in parentheses at the right margin:

$$\ln(A) = \frac{B}{T} + C \quad (1)$$

7. Define the symbols used.
8. When discussing numbered equations in the text, write out the word "Equation" and give the number. For example, you would write "see Equation 1."

OTHER IMPORTANT POINTS

Page numbering: Those pages in the report that precede the Introduction should be numbered with lower case Roman numerals. The Title Page is considered to be page -i-, but is not numbered. It is followed by the Abstract, numbered -ii-, and then by the Table of Contents, numbered -iii-, and so on. Beginning with the first page of the Theory, all

pages, including tables, figures and appendices, should be numbered successively with the Arabic numerals 1, 2, 3, etc.

Data: The word “data” is plural and thus takes a plural verb. The singular form “datum” is rarely used.

Verb tense: For the most part, your report should be written in the past tense; that is, you should write as if everything took place in the past except your construction of the report. “The objectives were . . .” “The apparatus consisted of . . .” “The valve was opened . . .” “The curve in Figure 3 shows that the heat transfer coefficient increased linearly . . .” (Notice: “The curve shows . . .”, but “. . . coefficient increased . . .”). This is often a troublesome point for writers, and hard-and-fast guidelines are not easily given. In many cases it is helpful to ask which of the following antecedents applies best to the verb in question: “When we planned or did this experiment . . .” or “As we are writing this report . . .” For the former, use past tense; for the latter, present tense. Note that even though the apparatus may still exist as you write the report, write about it as if it’s no longer there. The Theory section should be basically in present tense, but use past tense when describing previous work. Example: “Equation 3 gives the equation of state for this system. Jacob et al. (1994) obtained values for . . .”

Numbers, significant figures: One of the most common faults in reporting quantitative information is the inclusion of an excessive number of digits in numerical quantities. All numbers throughout your report should contain only the significant figures. Numbers should always be reported with at least one integer to the left of the decimal point -- even if that integer is 0. For example, write 0.591, not .591.