

King Saud University
College of Engineering
Petroleum and Natural Gas Engineering
PGE 480: Production Engineering Laboratory
Writing a Format Laboratory Report

Structure:

The report should have the following items:

1. Title (cover) page

- a. Number and title of the experiment
- b. Your name
- c. Date of the experiment
- d. logo

2. Introduction

It should include two main points:

- Purpose or objective of the experiment expressed clearly in only one or two sentences, including the main method used to achieve the objective.
 - Ex: the objective of the experiment was to determine the using.....
- Background and theory relating to the experiment. It can include information from previous research, explanation of theories, methods or equations used, etc. The main focus of the introduction should be on helping the reader to understand the purpose, methods, and reasons these particular methods are being used.

3. Materials Instruments and Methods

Usually and simply listing the equipment used. Graphs or figures may be included if they would be helpful.

4. Experimental Procedure

Includes the process of the experiment exactly as it was done in the laboratory. Usually the procedure is written out in paragraph form, but it

may also be written out step-by-step in the form of a numbered list. There should not be any results. A good rule of thumb for writing complete but concise experimental procedure is to include enough information so that others who read the report would be able to duplicate the experiment at a later date.

5. Results

This section covers all the results of the experiment, including:

- Raw data (temperatures, volumes, weights, etc.) organized into graphs or tables. Each graph, table or figure should be labelled and titled properly. The significant to making tables and figures effective is to refer to and explain each one in the body of the paper.
- Important results in verbal form. For the main results that will be expanded upon in the discussion section, use complete sentences (i.e. “The density of the crude oil was calculated to be **35 °API**”).
- Calculations. Typically, only a sample of each calculation is needed. For example, if the density of the crude oil in 5 samples has to be calculated and then averaged, write out the calculation for only one of them, then mention that the calculation was repeated for 5 samples and give the average of all 5. Correct significant figures should be used in all calculations. Make sure units are included in all the calculations.

6. Discussion

This section is the most important part of the report because this is the section where the results are explained, and a student can show the instructor that he has a comprehensive understanding of the concept of the experiment and the results obtained. The main question to be addressed in this section is “What is the significant of the results?”

Here are some strategies to help focus your discussion:

- Compare expected results with actual results. If the experiment did not turn out exactly as expected, think about why the results might have been different and try to explain why you got the results you did.
- Analyse experimental error. There is a degree of error in every experiment, so every lab report should mention potential causes of error. Be specific about what caused the error. Was it due to the equipment? Impurity of the sample? Error in calculations?

- Explain how the methods could be improved. Once you have decided what might have caused error, you should explain how the error might have been avoided. How could the setup be made more effective? Should you have been more careful with measurements? How could contamination have been prevented more effectively? Should more precise equipment be used?
- Explain the results in terms of the purpose. If the original purpose of the experiment was achieved, explain how the results show that purpose was accomplished.
- Relate the results to those of other, similar experiments. Depending on the nature of the experiment and the instructor's preference, you may want to compare your results to those of the rest of the class. If your results were similar to the others', this can be an indication that they were reasonably accurate. If they were very different, explain why they may have been different.

7. Conclusion

This section includes only one or two sentences that summarize definitive conclusions from the results.

The conclusion should related directly to the main objective. It should justifies itself based on the results; the actual results would be compared to the expected results. The degree of confidence the writer has in the conclusion is also must be shown.

8. References/Appendices

If outside sources have been cited, a references list will be needed. If there is a significant amount of extra data or calculations, it may be beneficial to put them into an appendix at the end of the report

General Tips

- **Be concise.** In scientific writing, it is very important to say as much as is needed while using as few words as possible. Lab reports should be thorough, but repetition should be avoided. The entire report should be clear and straightforward.
- **Write in the third person.** Avoid using the words “I” or “we” when referring to the experimental procedure. For example, instead of “I boiled 50 mL of water for 10 minutes,” the report should read, “50 mL of water was boiled for 10 minutes.” This can be a bit difficult to get used to, so it is important to pay close attention to the wording in the report.
- **Use correct verb tenses.** Many students become confused when trying to decide whether to use past or present tense in their reports. The general rules for verb tenses are as follows:
 - The experimental procedure has already been conducted, so use the past tense of the verb when referring to it:
Ex: The purpose of the experiment was...
The compound was weighed to 5 g...
 - The report, equipment, and theory still exist, so use the present tense of the verb for them:
Ex: The purpose of this report is... Bunsen burners are used...
- **Be prepared for the lab.** Before coming to the lab session, read the procedure in the lab manual thoroughly. Write down a purpose, hypothesis, and a general plan for the procedure you will follow and bring them to the lab with you. If you understand what you will be doing before beginning, it will be much easier to take relevant notes during the lab and to see what you will need to include in the report afterwards.
- **Take good lab notes.** When conducting the lab, it is important to write down all the results that will be needed for the report as well as all observations, any materials and equipment used, and anything out of the ordinary that may have happened. Notes should be clear enough, so they are easy to review when writing the final report. Tables are useful for keeping large amounts of experimental data in order, so you may want to include them in your laboratory notebook. Good notes will help you to write an insightful and accurate report.

- **Don't copy the laboratory manual.** If you are working from a lab manual, it can be used as a helpful guideline when explaining the procedure and the purpose of the experiment; however, you should not copy it word for word. By using your own words, you are showing the instructor that you have a good understanding of what is being done and why it is being done.
- **Write about what really happened** in the experiment, not what “should” have happened. Instructors grade lab reports based on understanding of the experiment rather than the results achieved, so if things did not go exactly as planned in the lab, resist the temptation to lie about the results in the report. Instead, try to explain what might have gone wrong and suggest ways the experiment might be improved in the future.
- **Use peer-reviewed sources for research.** If background research is needed for the report, only credible sources should be used. Online scientific and medical journals are good internet sources for this type of report; in contrast, unofficial websites that are not peer-reviewed should be avoided. Textbooks and encyclopedias are also helpful for explaining theories or concepts used in the experiment.
- **Cite your sources.** Always use parenthetical citations within your report to document all sources you have referenced. This includes all ideas that are not your own!