Lab Reports

What is a lab report?

Lab reports are documents that reflect a research process undertaken in a formal or professional research environment, or even in a classroom setting. Lab reports are common exercises for college students that are majoring in any science-related field, or even for those students taking a course for a required science credit. Common courses that require lab reports are the different levels of Chemistry, Biology, Astronomy, and many others. If you are conducting some sort of science experiment, chances are you will have to write a lab report at some point. A lab report is your own explanation of how you went about completing a project. Remember! An experiment is only as good as the lab report that describes it! Though expectations and requirements vary from one professor to another and from one discipline to the next, this handout can be used as a general reference when writing a lab report.

Below is a list of the do’s and don’ts of lab reports.

Do!

- Do understand the underlying theory before carrying out the lab measurements.
- Do use external sources such as textbooks and internet articles (reliable).
- Do make sentences short and clear. Do not be afraid of word repetitions.
- Do read your report at least once to make sure you’ve included every thing require of you.
- Do add captions to the figures/diagrams you use.
- Do perform reality checks. Is the report reflective of what actually happened during the experiment?

Don’t...

- Don’t ever write things you do not understand, even if you copy-paste the whole sentence from a trusted source. Remember, you should be able to explain what you’ve written.
- Don’t forget to cite what resources your reference in your report. The penalty is the same for any academic writing assignment—a plagiarism violation and most likely a hearing at the Office of Student’s Rights and Responsibilities.
- Don’t write generic sentences like “This is a report describing an experiment.”
- Don’t neglect MS Word spell check and grammar check options.
- Don’t forget to proofread your work.

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Sections to include in a lab report

What is included in a lab report is sometimes up to the discretion of the teacher of the course. Hopefully, you would have been provided with explicit instructions that outlined exactly what is expected of you for your assignment. However, this is not always the case, but that’s okay! Here are some standard sections that are included in a lab report:

A Title Page — A title page would appear at the front or beginning of your lab report and usually contains the title of report, your name, the course title and instructor name, and the date of the experiment. This information would be center-aligned as well as centered vertically on the page. There should also be a page number either at the top or bottom of the title page.

An Introduction or Statement of Purpose — This part of the lab report would come on the following page. In this section you could discuss the reasons why you chose this experiment or project, what the purpose of the experiment is, the hypothesis that you are testing, the justifications for your hypothesis, and any other pertinent information that would acclimate the reader of the report to the project.

Objective
The objective of the experiment specifies why the experiment is being done or the concepts that the experiment is intended to demonstrate. This should be written in future tense, third person, passive form, with flowing prose (do not use bullets).

Hypothesis
Your hypothesis should be simple and clear. There’s nothing wrong with beginning your hypothesis with the phrase, “It was hypothesized that . . .” Be as specific as you can about the relationship between the different objects of your study.

Most of the time, a hypothesis is written like this: "If [I do this], then [this] will happen."

“Be as specific as possible and do not hesitate to “over-explain” things. This is your project; you’re the expert here.”

Your hypothesis should be something that you can actually test. In other words, you need to be able to measure both "what you do" and "what will happen." Here are some examples that show you what not to do, and what to do.

Not a hypothesis:
Example one: “It was hypothesized that there is a significant relationship between leaf color and temperature.”

Example two: “Our universe is surrounded by another, larger universe, with which we can have absolutely no contact.”

Hypothesis:
Example one: “It was hypothesized that if leaf color change is related to temperature, then exposing plants to low temperatures will result in changes in leaf color.”

Example two: “If the size of the molecules is related to the rate of diffusion as they pass through a membrane, then smaller molecules will flow through at a higher rate.”

A good hypothesis defines the variables in easy-to-measure terms, like who the participants are, what changes during the testing, and what the effect of the changes will be. Also, make sure that your hypothesis is testable.

Validate your hypothesis
You need to assure your readers that this hypothesis was reasonable. What is the reasoning that led you to believe that your conjecture might be supported by evidence?
Previous research
This part of the Introduction shows the reader that you are aware of the work of other scientists in that field and that you comprehend the framework for the experiment you’ve completed.

Organization of this section
In abbreviated form, an Introduction section might look like this:

“The purpose of the experiment was to test conventional ideas about solubility in the laboratory [purpose] …

“The purpose of this lab was to assess and calculate oxygen uptake (VO2) using a variety of equations and exercise tests. VO2 is a good measure of cardiorespiratory endurance and aerobic fitness; it is also a great tool for prescribing exercise intensity for an individual going through an exercise program. Certain health benefits come from working at a specific percentage of an individual’s VO2 max, so knowing VO2 max makes it possible to prescribe the proper amount of exercise. VO2 can be expressed two different ways, absolute or relative to body weight. In this lab, VO2 will be expressed relative to body weight, which is in milliliters of oxygen consumed per kilogram of body weight per minute (ml/kg/min). There are many exercise tests used to measure VO2, however, the most common way is the Bruce graded exercise test protocol, which was the main focus of this lab. The other VO2 exercise tests used in this lab were the Rockport 1-mile walk test, the Ebbeling submaximal test, and the Cureton 1-mile run test. Individuals with a sedentary lifestyle and poor dietary habits will probably have lower VO2 values than their counterparts, resulting in poorer performance on these types of exercise tests [hypothesis]. There were also non-exercise VO2 tests used in this lab, these test included the BMI test, %fat test, and the waist girth test.”

Note: These guidelines are not set in stone and can vary from one professor or class to another.

Materials — This section is fairly straightforward. Here, you would list your materials, or if you wanted to go further in depth, you could discuss the function of each of the materials briefly (but not too much, because there’s a WHOLE section devoted to how you complete your experiment.

Methods — In this section, discuss how you went about conducting your experiment and testing your hypothesis. Be precise in providing details and as specific as possible, but stay relevant. Do not hesitate to “over-explain” things. Give as many details as necessary to prevent this experiment from going awry if someone else tries to carry it out. Be sure to offer exact measurements and quantify anything you can such as time elapsed, temperature, mass, volume, and so on. This is your project; you’re the expert here.

Structure and style
Organization is especially important in the methods section of a lab report because readers must understand your experimental procedure entirely. There’s a fairly standard structure you can use to guide you, and following the conventions for style can help clarify your points.

• Write in Prose: Here, you are telling the reader what already happened through prose. Avoid sounding like a recipe.

• Past tense: You are describing something that has already happened so use simple past tense.

• Passive voice vs. first person: Avoid using the first person (“I” or “we”).

Data — Here, you will present the data collected from the experiment. You can do this using tables, or you can write out your data in paragraph form (OR both!).
Results/Discussion or Analysis —  Sometimes the Results and Discussion sections are combined into one, or they can be separate. It depends on what makes the most sense for your report. In this section, present the findings of your experiment/lab work and discuss the implications of these findings. Did your work yield the results you thought it would?

How do I write a strong Results section?  This section provides the most critical information about your experiment: the data that allow you to discuss how your hypothesis was or wasn’t supported. But it doesn’t provide anything else, which explains why this section is generally shorter than the others.

Don’t try to draw conclusions about the results—save them for the Discussion section. In this section, you’re reporting facts. Nothing your readers can dispute should appear in the Results section. This should be a short paragraph, generally just a few lines, that describes the results you obtained from your experiment. If you use tables or figures keep them simple and straightforward.

How do I write a strong Discussion section?  The discussion section tells your readers what to make of the Results you obtained.

In this section, you will, as a rule, need to:
• Explain whether the data support your hypothesis
• Acknowledge any anomalous data or deviations from what you expected
• Derive conclusions, based on your findings, about the process you’re studying
• Relate your findings to earlier work in the same area (if you can)
• Explore the theoretical and/or practical implications of your findings

Conclusion — In this section, simply provide a wrap-up and closure to your experiment. Include final thoughts on the subject of your work. What is it your research proved to be true?

Reference List — On this page, list any source material that you referenced in your report. Use hanging indents when completing your Reference List.

Formatting of the Lab Report

As previously discussed in this document, lab reports are generally associated with science-based academic work. That being said, there is a whole citation and formatting style guide devoted to science related writing assignments. The American Psychological Association (APA) Manual is most likely the style guide you should reference for how to cite sources in your report as well as how to properly break your lab report into sections, and even subsections if necessary.

If you can’t afford to go and buy an APA style guide, not to worry! There is a wonderful and FREE resource available online. Simply Google “Purdue Owl” and click the first search result. You will be directed to the Purdue Owl homepage, where you will be able to select “APA Style Guide” and navigate through many pages of useful information (like how to different types of source and which level heading you should use).

Here are some quick tips to help get you started:

• Level 1 and 2 Headings are the most common for any work in APA—the headings go all the way down to Level 5, but you probably won’t need that many!

• Level 1 headings are centered and bolded and appear at the beginning of a new section.

• Level 2 headings are used to break down Level 1 sections into more specific subsections. This level of heading is left-aligned, bolded, and they appear within Level 1 sections.

• In-text citations for APA style are fairly simple to insert: They look like this: (Last name of author(s), Year of publication). They ALWAYS come before the period that ends a sentence where source material was used.
Type of Language Use in a Lab Report

Lab reports are fairly formal documents. They present findings and orient the reader to the framework of the experiment being conducted. It is your responsibility as the writer of the report to make sure that it is clear, concise, and informative.

Since lab reports are technical, meaning they use a lot of specialized language and concepts, it is okay to use “big” words that relate to the field of study or the experiment itself. Just keep in mind that you will need to have to ability to explain those complex and specialized terms to someone who might not be familiar with your field.

Lab reports are NOT literary analyses. They are NOT argumentative papers. Therefore, it is more acceptable to write shorter sentences, as long as the overall idea that is portrayed makes sense. In other words, write short, to-the-point sentences, but don’t jump around from topic to topic in each sentence. Let your ideas flow in a logical and linear manner.

How Lab Reports are Different from Other Written Assignments

If this is your first time writing a lab report, or even if you are a seasoned report writer, it is important to note the differences between lab reports and other academic writing styles, such as argumentative essays.

Think back to your freshmen composition classes? What is one of the first things you learned: put a thesis in your introductory paragraph! This is not necessarily true for lab reports, because all of the research is building up to the final product or discovery. Your introduction in a lab report simply orients the reader to what you will be exploring—the purpose of your experiment. Your conclusion will actually contain your final findings.

Also, as stated in other sections, you don’t really have to worry about writing long, flowing sentences. Focus on presenting facts, data, findings, etc. as clearly as possible. You don’t want your report to become muddled with too many ideas at once.

Tips for consultants

It is important to be aware of the general structure of lab reports. Having a general idea of what to look for will make the session go more smoothly.

There are some specific things consultants should keep in mind about lab reports: The ABC of science communication is that it should be:

5. Accurate and Audience-Adapted
4. Brief
3. Clear

Accuracy and Audience-Adapted

Being accurate is everything in the discipline of lab reports. Make sure to provide accurate measurements and to be assertive. Be very aware of using scientific language which is what your audience expects when reading your report. Keep this objective and straightforward tone in mind when writing longer essays.
**Brevity/Conciseness**

Brevity is important in all disciplines and is stressed in science. Get to the point. There is no room in any paper for sentences that do not contribute something significant to the paper.

**Clarity**

Unlike writing in the Humanities, writing in the scientific discipline must be explicit in its meaning. Lab reports detail exactly what went on in the lab and should be clear enough so that if the reader was to follow your methods, he would garner the same results.

**Format**

The basic format for lab reports:

- Introduction
- Methods and Materials
- Results
- Discussion

“This format, sometimes called “IMRAD,” may take slightly different shapes depending on the discipline or audience; some ask you to include an abstract or separate section for the hypothesis, or call the Discussion section “Conclusions,” or change the order of the sections. Overall, however, the IMRAD format was devised to represent a textual version of the scientific method.”

“**Section Scientific method step As well as…**

Introduction states your hypothesis explains how you derived that hypothesis and how it connects to previous research; gives the purpose of the experiment/study.

Methods details how you tested your hypothesis clarifies why you performed your study in that particular way.

Results provides raw (i.e., uninterpreted) data collected (perhaps) expresses the data in table form, as an easy-to-read figure, or as percentages/ratios.

Discussion considers whether the data you obtained support the hypothesis explores the implications of your finding and judges the potential limitations of your experimental design.”

**Citations**

Although the sciences usually utilize APA for citing, it is important to note that citation styles vary from class to class and from one professor to another. Be sure to ask the student what style the professor recommends using. If the student is unaware of what style to use, encourage him to ask his professor.

**Endnotes and References**

5 “Guidelines for Student Lab Reports and Student Papers.” *The Center for Writing Studies.* The Center for Writing Studies: The University of Illinois at Urbana-Champaign, 20 February 2013.
6 “Scientific Reports.” *The UNC Writing Center.* The Writing Center at UNC Chapel Hill, 20 February 2013.