How to Write a Formal Lab Report

Overview
Scientists share their findings through publications, primarily in the form of journal articles. To prepare for a career in science, one must be able to convey scientific results in the appropriate format. Your formal lab reports for this class should be organized like a scientific journal article and will be between 5-8 pages in length plus tables, figures and references.

Formatting
Reports must be typed, single sided and double spaced, on clean white paper that does not have writing on the back. Tables must be typed, and graphs must be prepared with Excel or another graphing program.

Reports should be written in the style of a scientific journal article, with the sections listed below. An abstract is not required. Key features of each section are described below.

Title
• The title must be descriptive. The title of the lab exercise is not sufficient.

Introduction (no more than 1 page)
• Introduce the topic of the study.
• Begin the section with a concise description about the physiological process or phenomenon examined in your experiment.
• End by stating the hypothesis that will be examined and/or the goals of the study.
• Include information about
  • The subjects used in the experiment. Did you perform the experiment on humans, dolphins, or cells? Did you use a computer simulation?
  • Relevant background, sufficient to set up the question.
    • This section should provide the reader with enough information to understand what you are doing and why you are doing it.
    • Do not copy the experimental objectives from the lab instructions.
    • Do not include detailed descriptions of physiological systems. Save them for the discussion, where you can relate them to your data.

Materials & Methods (~ 1 page)
• Describe how the experiment was performed.
  • The level of detail must be sufficient to allow someone else to repeat the experiment/measurement.
  • Focus on what was required to get the data and what you did with it (statistically).
Units must be abbreviated. Do not include periods after abbreviations. Note that an “s” is not used to designate the plural form.

- centimeter, centimeters = cm
- minute, minutes = min
- day, days = d
- milliliter, milliliters = mL
- degrees Celsius = °C
- millimeter, millimeters = mm
- hour, hours = hr (or h)
- millivolts = mV
- kilogram = kg
- mmoles/L = mM
- liter, liters = L
- second, seconds = sec
- meter, meters = m
- volts = V

Results (~1 page of text)

- Present the data
  - Data may be summarized in graphs or tables, or written as text.
  - Do not repeat values in the text that you have already included in a table or a graph.
  - Information about formatting tables and graphs is given below.
- This section must include a narrative that describes the data in words. (In other words, this section is more than just your tables and graphs.) Figures and tables must be cited by number. For example: Heart rate increased with exercise intensity (Fig. 1). Point out the trends and other key features in the data that you wish the reader to note.
- This section must be written in past tense.
- You should not interpret the data in this section – that’s for the Discussion.
- Place tables and figures at the end of the report; do not place them within the text, even though that’s how they appear in published journal articles. Group pages containing tables together in numerical order, and do the same with figures.
- Be selective about the data you present. You may make a lot of graphs while exploring your data, but you should only include the graphs that demonstrate the trends and concepts you want to discuss.

Formatting Tables and Figures

- Tables
  - Each table must contain a number (i.e., Table 1) and a title that describes its contents. The number and title must be placed at the top of the table.
  - The word “data” or “results” is not a suitable title for a table. The title should be complete enough to enable the reader to understand what the table shows without having to read the text.
  - The columns must have headings with units.
  - Each table has to fit onto a single sheet of paper. You can put more than one table on the same page, but please do not have one table span multiple pages.
  - Any abbreviations should be explained in the legend, which is placed below the table.
  - The tables should be placed in numerical order at the end of the lab report.

- Figures
  - Graphs, diagrams, and photos are all called “figures.” It is incorrect to call a graph “Graph 1,” for example; it would be “Figure 1.”
  - Each figure must have a figure legend that includes a number (i.e., Figure 1) and a brief description of what is shown. The figure legend should be placed below the figure.
not confuse this figure legend with the item called a legend in Excel. The legend in Excel is a key to the lines or bars in a graph.)
- Figures are numbered consecutively in the order in which they are first mentioned in the text. They are numbered separately from tables.
- Figures should not have a title at the top.
- The plot area of figures should be white and should not contain gridlines.
- The key that assigns group names to specific lines (called a legend in Excel) should be located within the axes of the graph, and not off to the right side. Only include a key if it is relevant to the interpretation of the graph, and label it appropriately. (Replace Series 1, Series 2, etc., with actual group names.) If the key doesn’t fit easily into the graph, put the information in the figure legend below the graph instead.
- Individual data points must be shown in line graphs (not just the trend line).
- Figures should be printed in numerical order and placed at the end of the lab report, after all the tables.

Discussion (2-3 pages)
- Interpret your results in this section; draw conclusions from your data. Relate your conclusions to the hypotheses/goals discussed in the Introduction. Do the data support the hypothesis? Why or why not? (It’s okay if the data do not support the hypothesis. Just explain why you think that is!)
- Explain the relationship between your results and known physiological concepts. Are your results consistent with what is already known about the system? Explain the mechanisms underlying your results. Be sure to cite references!
- You must discuss all the data that you presented in the Results section.
- Think of this section as an essay. It must be logically organized. Each paragraph should address a single topic, which is typically introduced with a topic sentence at the beginning.
- Discuss your most important findings first, and follow with more minor points.
- End with a paragraph that summarizes the major conclusions of the work and relates the findings to the field as a whole.

References
- You must cite the sources from which you obtained the information for your paper. This includes any facts or ideas that are not your own.
- You must include at least three primary reference: a scientific journal article.
- Cite in the text and in a Literature Cited section.
  - In text: The amount of sodium in the extracellular fluid influences the magnitude of the action potential in a neuron (Hodgkin & Katz, 1949).
- You may also cite information from your textbook:
  - In text: Aldosterone affects Na\(^+\) and K\(^+\) concentrations in the filtrate, and ultimately in the urine (Moyes & Schulte, 2006).
• In the Literature Cited section, organize your references alphabetically by first author.

A final note:

Plagiarism will not be tolerated. You must cite all ideas that are not your own. Replacing a few words is not paraphrasing. Re-write the information in your own words. You will not receive credit for ideas that have been copied directly from published sources (or web sites), even if you place the material in quotes and reference it. Everything in your paper must be stated in your own words to show that you understand the concepts well enough to write about them.

Also, please present your own work. While you will be working in groups to collect your data; analysis, background, tables, figures and results should be your own work. Reports failing to meet this requirement will not be graded.