Writing Scientific Lab Reports

A well written scientific paper explains the scientist’s objective for doing an experiment, the experimental design and execution, and the meaning of the results. If you have read scientific papers, you will have noticed that a standard format is frequently used that allows a researcher to present information in an exceedingly clear and concise manner. Scientific papers are subdivided into the following sections: Title Page, Abstract, Introduction, Methods and Materials, Results, Discussion, and Literature Cited.

General Comments on Style and Format

- The report should be double-spaced throughout. Each sub-heading should be capitalized and centered at the beginning of the section, and double-spaced from the lines above and below.
- All scientific names (genus and species) should be italicized, with the genus name capitalized and the species name in lowercase (*Escherichia coli*). After you have used the organism name once, it is acceptable to simply capitalize and abbreviate the genus name by it’s first initial, leaving the species name as is (*E. coli*).
- Do not underestimate the importance of an effective and accurate title. Make certain to include the name(s) of your unknown organism(s) and the number of the unknown you were assigned.
- Remember that this is a scientific report and your language and style should be as concise, objective, and quantitative as possible. Don’t be cutesy.
- Avoid using a single sentence to relate a single action; this results in very lengthy, wordy passages. A sequence of actions can be combined into one sentence to improve clarity and readability. For instance, in the Materials and Methods section you would say:
  
  “A TSA plate was quadrant-streaked and incubated at 37°C for 24-48 hours.” Instead of...
  “I streaked a TSA plate. I then incubated it at 37°C. It was left in the incubator for 24-48 hours.”
- While not a steadfast rule, the past tense is most often used throughout the report, specifically in the abstract, methods and materials, and results sections. The introduction and discussion are a bit more flexible, and the use of present tense here may be more effective. However, try to maintain consistency of tense within each section. If you start the discussion in the present tense, continue with it throughout.
- Try to avoid writing in the first person; instead, opt for the third person. In doing so, you will also be using the passive voice quite often, instead of the active voice. Using the example below:
  
  “A TSA plate was quadrant streaked” is passive and does not use the first person, unlike the second example:
  “I streaked a TSA plate.”
The first example takes the focus off you, the researcher, and places it onto the organism. This type of construction is a bit more impersonal and is preferred in scientific writing.

**Title Page**
Your paper should begin with a title that succinctly describes the contents of the paper. Use descriptive words that you would associate strongly with the content of your paper. It’s helpful to write your title as if it would appear in an electronic database search, keeping in mind that search engines key in on words found in the title. Underneath the title, include each of the following on a separate line, double-spaced and centered: your name, your professor’s name, the course (day and time), and the date.

**Abstract**
The abstract summarizes, in one paragraph usually, the major aspects of the entire paper. The length should be kept to about 200-300 words maximum. The purpose of the abstract is to help readers decide whether they want to read the rest of the paper. Therefore, enough key information must be included to make the abstract useful to someone who may want to reference your work. In the following sequence, it should tell the reader:

- what the objectives of the study were (from the Introduction section)
  - state the purpose of your study very clearly in the first or second sentence
- how the study was done (from the Methods and Materials section)
  - indicate only the key techniques used without going into excessive detail
- what results were obtained (from the Results section)
  - report those results that answer the question you were asking.
- the interpretation, conclusion, or significance of your results (from the Discussion section)
  - clearly state the implications of the answers your results gave you

Although it is the first section of the paper, many find it much easier to write the abstract last. To begin composing the abstract, take whole sentences or key phrases from each section and put them in a sequence that summarizes the paper. Then, set about revising or adding words to make it all cohesive and clear.

**Introduction**
The introduction defines the subject of the report and is organized to move from general information to specific information. A good introduction should:

- clearly identify the subject of interest
  - use key words from your title to get focused directly on topic
- establish context by providing a brief review of existing literature/research on the subject
• lead the reader to your statement of purpose by focusing your literature review from the more general context to the more specific topic of interest to you
  o clearly state the purpose/hypothesis that you investigated
    • it is perfectly acceptable to use a statement like, “The objective of this study was to...”
  o provide a clear statement of the rationale for your approach to the problem studied
    • how did you determine the best way to go about identifying your unknown(s)

This last portion of the Introduction should be a statement of objectives and hypotheses. It provides a good transition to the next section, Methods and Materials, in which you will explain exactly how you proceeded to meet your objectives and test your hypotheses.

**Methods and Materials**
This section provides all the methodological details necessary for another scientist to duplicate your work. The Methods section should **NOT** be a step-by-step directive, as you would see in your lab manual. It should read like a narrative, as if you were verbally describing the process of the experiment. The difficulty in writing this section is in recognizing what information to include and what to leave out. You will want to provide enough detail for the reader to understand the experiment without overwhelming him or her. A good rule of thumb is to assume your reader has a general background of and knowledge about your subject.

Do not rely on your memory when writing this section. Keep detailed notes of all the media you use and tests you perform as you work on your unknowns. Write down what you did, and in what order so that when you construct this section, you will already have most of the information on-hand in outline form.

**Results**
The results section should summarize the results of your experiment in an orderly and logical sequence. It should mirror the structure of the Methods and Materials section; the first results you report should be on the first experiment you performed, the second set of results should be on the second experiment performed, and so forth.

The most challenging part of writing this section is to remember **not** to interpret the data here or discuss their implications. Simply record in an objective manner what was observed and avoid interpretive language, (words like “suggest”, “imply”, etc.)

**Discussion**
This is the section where you discuss the meaning of your results. Organize the discussion to address each of the experiments for which you presented results; discuss each in the same sequence as presented in the results, providing your interpretation of
what they mean in a larger context. Here, you may also want to discuss suggestions for improving on your experimental technique or difficulties you encountered.

**Literature Cited**
This section gives an alphabetical listing of the references that you actually cited in the body of your paper. It is presented on a separate page from the rest of your report. Literature Cited is not the same as a bibliography, which contains references that you may have read about but have not specifically cited in the text. If you include a literature-cited page, make sure you have actually cited something in your paper.

A complete format list for virtually any type of publication can be found at [http://www.monroecc.edu/depts/library/cse.htm](http://www.monroecc.edu/depts/library/cse.htm)