How Do I Remember This? You Don’t.

Do you have difficulty remembering different formats for biology, chemistry and psychology lab reports? Good news: you do not have to remember any of this. Simply look up the guidelines when you write, follow them exactly, edit carefully and triple check the format when you are done. Different disciplines (and sometimes different professors within a discipline) can have different expectations for lab reports. You don’t need to “remember” anything: look up and apply the proper format when needed.

Clear, Accurate and Concise

Lab reports are the foundation of scientific communication. Accuracy and clarity are paramount. The reader should be able to follow your logic, reproduce your experiment, understand your results and see how these results and their implications fit into the larger context of the study of biology.

Read a few biology lab reports. Use them as models and follow their format and style.

Title Page

Follow requirements for your course (for example, first year bio labs put your name and lab group on the top right hand corner of the page). Titles are centered. Information such as date and course number is placed in the bottom right hand corner of the page. It’s simple: follow the format.

A good title is straight-forward, notes essential details and has no more than twelve words. Try to start the title with a keyword, not “a” or “the.” Where applicable, note the type of study, what is investigated, location and the organism involved (common and scientific names). The first letter of the genus is capitalized; species and genus are either italicized or underlined as in “Protoemic examination of Ralstonia eutropha in cellular responses to formic acid.” Again, simply follow the example of published papers.

Abstract

An abstract is an extremely concise summary of your paper, a précis of its objective, results and conclusions. It should be under 150 words. Check requirements: in first year biology, an abstract is not required.

Introduction

An introduction contextualizes an experiment. It presents relevant previous studies and briefly explains what new information your study may provide. An introduction defines key terms and notes why the study matters.

A strong introduction explains why a study was performed, what knowledge already exists about the subject and what the specific purpose of the study is. Correctly cite other studies to place your work within the existing scientific literature, but this is not an exhaustive literature review.

State what you did, but do not go into the specific details of your Methods or Results sections.
End by clearly summarizing your report’s purpose. Most experiments test a hypothesis. State the hypothesis and how it will be tested. A hypothesis declares that you expect to see an effect or change. Predictions state what you expect them to be. Note the rationale on which the predictions are based. Do not use the words “believe” or “believed.”

**Parts of Introduction**

1. Relevant conceptual background to the study
2. Brief synthesis of current knowledge on the subject
3. Brief statement of purpose of study including hypothesis, predictions and rationale

**Materials and Methods**

This section, in the past tense and third person, explains how a study was conducted so a reader could replicate the study. It is a step-by-step description of the procedure followed. Describe what you did, not how to do the experiment in the future. You can use diagrams. Students often start with this section as it is straight-forward.

Explain experimental design, data acquisition methods, measurement techniques, equipment, sample size and so on. If these details are in a lab manual, you can cite this, but if any procedures were changed, you must describe this.

Where possible, quantify things. Be specific. How many milligrams of *Lophora williamsii* did subjects ingest? When was the scat collected? When editing, make sure everything that can be quantified is quantified.

Note how the data were analyzed and what calculations and statistical methods were used. Do not explain how equipment was used, but do note the make and model of special equipment. For field studies, a map can be used. Describe the site and time of study. Include all information about the location that is important to replicate the study. Avoid unnecessary information.

Like Goldilocks, you have to get this “just right.” You don’t want too much detail, but you need enough for someone to duplicate the experiment. Avoid unnecessary information.

Use prose in the Materials and Methods section, not bullet points or recipe format. Don’t number sentences or simply list materials: incorporate them into sentences describing your process.

Be precise and concise with data. Describe formulae used, any data manipulation and statistical analyses. If you were responsible for part of a lab but data from the entire class was used to calculate results, note the total sample size.

**Results**

The Results section is a factual account of findings. It states (in past tense and third person) what you observed and is free of interpretation. Do not begin with tables or figures; always start with text (paragraph format) to state what the study found. Raw data in table format is put in an Appendix.

Be careful with statistical analyses. Focus on important points. Do not be too detailed or wordy. Most of the details will be evident in figures or tables: only the most important points of each one should be described in paragraph format. There is no need to reiterate everything that is in a figure.
Figures and tables do not suddenly appear: introduce them by summarizing important data before each table or figure appears. Do not describe the axes of figures. Simply highlight trends or interesting points (“halitosis increased with consumption of *Lophora williamsii*”). Never repeat summarized data in a table and figure.

Number tables and figures (e.g. Table 1 or Figure 1). Figures are captioned; tables are titled. Titles and labels appear above tables; captions and labels appear below figures. Label axes. Do not forget units. Include a legend if necessary. Indicate sample size. Label columns or rows on tables. If comparing data between figures, make sure scales coincide.

The Results section states (but does not examine) main findings. Readers should clearly grasp them without having to interpret tables or figures. The text notes significant findings. Use actual values to quantify trends. Note ranges of values or percent changes. Never discuss implications of results in this section.

A lab report parallels the experimental process (D. Flynn, 1988):

<table>
<thead>
<tr>
<th>Experimental Process</th>
<th>Lab Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the problem?</td>
<td>Introduction</td>
</tr>
<tr>
<td>How did I solve the problem?</td>
<td>Materials and Methods</td>
</tr>
<tr>
<td>What did I find out?</td>
<td>Results</td>
</tr>
<tr>
<td>What does it mean?</td>
<td>Discussion</td>
</tr>
</tbody>
</table>

**Discussion**

Your original interpretation is very important: this section explores results and relates them to your hypothesis. It compares actual results to what you expected to find and attempts to give a credible reason for the observed results.

Go from the specific to the general. First, discuss major conclusions. Explain the meaning of your results and if they support the hypothesis. The first paragraph notes if the predictions were right or wrong and whether the hypothesis was supported. Note the degree to which the evidence supported your hypothesis. Were observed results completely supportive? Were there variances? Remember, you never “prove” or “disprove” a hypothesis. Any experiment is too limited in scope to do this.

Next, extend your results. How do they compare to similar, recent studies? Were they consistent? Why or why not? Use literature to support your interpretations. Avoid direct quotations; paraphrase (with proper citation). Weave original ideas into this section. Give original interpretations. If possible, suggest new experiments to further shed light on issues raised by your results. Explain any unexpected results, but don’t leap to blame yourself for such results. Never invent errors to make sense of variances. Consider if different tools or a different approach could result in clearer results. Was the design of the experiment invalid? Were incorrect assumptions made? Was equipment inadequate?

You may re-state your results as you interpret them, but don’t re-do the Results section here. Don’t refer to any tables or figures in the Discussion section.
Did something unforeseen generate data? If so, point out another possible explanation for your data (perhaps an alternative hypothesis).

Make sure you have not simply re-stated findings that belong in the Results section. End with a brief concluding statement. How are the results applicable? Can they be generalized to bigger issues? Why do they matter?

References

There are two facets to correct referencing. One is the format for citing things in your text. The second is the list of references at the end of your lab report. Nobody can remember every nuanced rule for doing this: simply find the rules and look them up.

Which Citation System?

Make sure you know exactly which documentation system is expected. Documentation guidelines are often presented in your lab manual. If this is not the case, ask your professor (it might be the CSE method or systems used by the journal Botany or the Canadian Journal of Zoology).

Make sure everything in your References section is used in the report (and everything cited in the text is in the References list).

Appendix

Present raw data and sample calculation(s) here if applicable. Make sure you label everything correctly and include units.

Remember...

"Species" is singular and plural. "Genera" is the plural of "genus." The genus is capitalized; species name is lower case unless a proper noun ("Canada goose"). Underline or italicize scientific names.

Eliminate unnecessary words. These bold faced words can be cut: It can be stated that the organism prefers light. In order to conduct the experiment we used a flashlight.

Watch count and non-count nouns. If you can count the items, use “fewer,” “less” if you cannot. There is less money; I have fewer dollars. This is true for “amount” and “number.”

“Affect” is always a verb. “Effect” is usually a noun. “Different from” is correct. “Different than” is incorrect. “It’s” = “it is.” “Its” is possessive (It’s how a cat cut its paw). “Between” is for two things, “among” for more than two.

Put a zero in front of a decimal point (0.49 not .49).

Support and Information

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