Guideline for lab reports

Supervisor and team:

Due date for the report:

We recommend sticking to the IMRaD (Introduction, Material and Methods and Discussion) structure as seen below.

Introduction

Idea: I summarized the theoretical background and clarified my expectations.

- What is the essential question behind the experiment?
- Which kind of theoretical background do I need in order to make my results understandable?
- What do I want to focus on in the discussion of my report?
- Do I have a certain expectation concerning the results (and why)?

Methods

- Should only be mentioned briefly in most reports.
- But: If your report is of methodological nature, give more details, such as:
  - Equations.
  - Concept of the method employed.
  - Theoretical background with focus on relevance in the scientific context.
- Status of the current scientific research.
- If your report is longer, introduce its structure (e.g. “In section 1.1, X will be introduced. We will come back to that in section 1.2 where we do Y.”).

Material and Methods:

Idea: I mentioned and explained all the information that is crucial in order to exactly reproduce the experiment.

- Describe all materials used in detail.
- Mention your methods (e.g. spectroscopy, microscopy...).
  - A short note on how you proceeded and why can be included e.g. if the employed method was modified from the standard method.
- Refer to the research status described in the introduction (see above) if needed.
- Statistics:
  - Statistical methods can be assumed as known to the reader.
  - But describe them in a way that determines them to full extent (e.g. if you perform a t-test, clarify which one (parametric vs. non-parametric, paired vs. unpaired, were results corrected in regard to sample size? ...)}.
explain the required error calculation.

- in case of complex experimental set-ups, include an image e.g. a scheme or a picture (don’t forget to cite properly if needed; details on how to employ figures can be found in the results section below).
- if equations are needed in the results section below, they should be introduced and explained here.

results

idea: i have summarized the most striking data i found in the experiment objectively.

- subsections should begin with an introductory sentence:
  - why and with which kind of methodology was this experiment performed?
- results should be presented with a sensible structure and order, e.g. individual steps of the experimental parts need to be sorted thematically or, in case of larger experiments, be put into individual subsections.
- results should be described objectively.
  - no discussion of the results in this part of your paper!
  - emphasize the results that you will refer to in the discussion.
- figures:
  - choose a fitting representation of your data. depending on the employed calibration or scaling (e.g. linear vs. logarithmical) the same data can look entirely different.
  - the description of the figure in the text should appear before the figure itself.
  - figures always need a caption.
    - this text needs to include a sufficient description of the methods.
    - it should include enough information for the caption and figure to be fully comprehensible without referring to the text of your paper.
    - if necessary, details from the caption can be included in the normal text of your report.
  - please use units, error bars and sensible axis labels!
- tables:
  - need a meaningful heading (e.g. displayed measurement, duplicates...)
  - have a proper format (avoid word wrappings, they should not be broader than the text; are labeled correctly – please take a second to consider, which information should go into the rows and which in the columns.)

large datasets: only show relevant data with reference to attachments or a digital medium.

discussion

idea: i evaluated the results, questioned them critically and contextualized them with regard to other information (e.g. my expectation or results in literature)

- be careful in your choice of words: your paper presents hypotheses, not facts, as far as the underlying theory is concerned!
- summarize relevant results:
  - relevancy is defined by the essential question underlying your experiment or by possible sources of error.
- you should refer to the expectations previously stated in the introduction.
- Discuss possible errors and the reasons for them.
- If needed, limitations of the experimental methods should be discussed.
  - If you conclude that the experiment was indeed limited due to the method applied, you may suggest an alternative or modified experimental design that could provide better results.
- The results should be discussed in their scientific context.
  - A comparative discussion with findings from other scientific works should happen if possible.
- End with an overall conclusion: What can be concluded from the experiment?

Don’t forget a bibliography and if needed an appendix!