Guidelines for writing the **RESULTS** section of a lab report

**GOAL:** to clearly and concisely present the results of experimental work.

This section of a lab report presents data collected during an experiment – those things that you observed and/or measured, for example mass recovered, % yield, melting range or boiling range, physical appearance, spectra, chemical tests, *etc.* It does NOT repeat or discuss experimental methods, nor does it interpret the results (“i.e. what do the data mean?”). Well-written Results sections use text and graphics very economically.

Results should be organized so that it is easy to see how they relate to the stated objectives of the experiment. This may mean that you need to present them in a different chronological order than you obtained them.

All numeric values must be identified with their *scientific name, must have proper units attached, and must have the proper number of significant figures.* The published sources where you looked up accepted values must be cited properly.

**Common problems in novice reports**

*Vague descriptions:* avoid words like “very”, “excellent”, “good”, or “poor” unless you have a valid basis for comparison. It is normally best just to give a numeric result.

*Use correct singular and plural forms of words* (and the corresponding verb form):

<table>
<thead>
<tr>
<th>Singular</th>
<th>Plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>datum</td>
<td>data</td>
</tr>
<tr>
<td>spectrum</td>
<td>spectra</td>
</tr>
<tr>
<td>apparatus</td>
<td>apparatus (no change)</td>
</tr>
<tr>
<td>criterion</td>
<td>criteria</td>
</tr>
</tbody>
</table>

Present tense rather than past is appropriate when you direct a reader to a graphic (“Results of chemical tests are shown in Table 2.”) The same holds any time you refer to things expected to be constantly true instead of “one-time” events from the experiment.

**Required** in Results sections (unless not pertinent to the experiment):

- **Yield** in grams and as percent of theory in the following format: "The yield of cyclohexene was 10.3 g (43%)." [*If appropriate, “recovery” can be used in place of “yield”*] Use the proper number of significant figures! *[Show all calculations in an Appendix, including those for finding the limiting reagent.]*

- **Product characterization:** description of how you verified that you obtained the desired chemical. For example, if you use boiling / melting points or IR spectra, always compare to published values, cite where you looked up these values, and comment on the comparison. If you do chemical characterization, *name* every compound used for [+ ] and [- ] controls and describe outcome of tests.

**Optional** (include if useful for completeness and clarity):

- **Other pertinent information** (unexpected results should be included here).
- **Numbered Tables and/or Figures.** Tables are numbered sequentially in the order in which you mention them in the body of the report. Figures are treated separately the same way. *If you are including a Table or Figure in your report, refer to the table and figures guidelines document on the course website.*
Guidelines for writing the **DISCUSSION** section of a lab report

**GOALS:**

a) Show how results relate to the reasons for doing the experiment  

b) If yield is especially low or high, to explain or speculate on why  
c) Possibly suggest how the experiment might be modified for better results

The Discussion helps the reader understand the significance of the results. *The significance of each result (or group of related results) should be linked to the objective that it serves.* The discussion section should begin with restating the experimental objectives and reviewing the theoretical principles relevant to the reaction and product recovery. The text should make clear how each result (or set of results) meets at least one of the objectives, as well as assuring that all the objectives have been addressed (met or not met). The text should be organized so that it follows the order in which the objectives for doing the work were laid out. This is the most important part of the Discussion.

You should always offer scientifically sound speculation for the reason(s) why the yield was low or high. Some possible reasons include: loss among drying agent, hold up volume in boiling flask, losses in washes, loss in recrystallization solvent, and incomplete reaction (perhaps due to equilibrium not lying strongly to the product side or the temperature not being high enough for a favorable reaction). Don’t just guess: think critically about conditions or events that may have interfered, including whether unwanted side reactions would have been likely (describe specific suspected reactions). Also, think about the effect that side products would have on melting range and the % yield. *Generic “human error” is never a valid cause for low yield, and this phrase should never appear in a report.*

If you think you have a reasonable idea for improving the protocol, this is a good place to offer it.

Discussion sections should end with a concise (typically one sentence) summary of the outcome of the experiment, keeping in mind the stated objectives.

Guidelines for writing the **APPENDIX** section of a lab report

**Goal:** Helps a scientist understand how the data were obtained and allows for further explorations of scientifically related concepts.

In this section, you should give the detailed calculations including: limiting reagent, % yield, and any other calculations needed to report values in the “Results” section of your report. None of these calculations should be in the body of the report; instead refer the reader to the appendix by writing: "A detailed description of the calculations can be found in the Appendix."

In addition, your answers to the enrichment questions posed in the protocol should be here.