

## Guidelines for answering postlab questions, and writing formal lab reports

### Postlab questions:

This applies to any postlab question in which you must write a short answer, especially any question in which you have to explain anything.

- Please don't just copy down part of the lab handout (or any external source) for your answer. If I wanted to read that, I'd print it out myself. You will get zero points on any question where it seems clear that you've just copied your answer from some external source. Copying always gives a bad answer anyway, for the following reason:
- Please be **very specific**, and cite your own data (if any), and the literature data you are comparing to (if any). The idea is to explain your own results, not just list general ideas. Here are some examples, using the Melting Points postlab, which is the first postlab in CHM 245:
  - Here is a **bad** answer for the melting point unknown: "Melting points for pure substances are high and narrow, whereas impure melting points are low and broad. When mixing substances, if the substances are the same, the melting point will stay high and narrow, but if they are different, the melting point will decrease and get broader." This is a bad answer because it doesn't say anything specific, nor does it cite any data, nor does it directly explain which unknown you thought you had.
  - Here is a **good** answer: "Our unknown was cinnamic acid. This is because, when we mixed our unknown with cinnamic acid, it melted at 131.2 - 133.5 °C (calibrated), which is very close to cinnamic acid's literature melting point (133 °C). This range was also higher and narrower than either of the other trials. When we mixed our unknown with urea, it melted at 102.4 - 115.6 °C (calibrated), which is much lower and broader than urea's literature melting point (135 °C), so our unknown was definitely not urea. When we mixed our unknown with benzoin, it melted at 124.6 - 130.2 °C (calibrated). This is closer to benzoin's literature melting point (137 °C), but since this is still a bit lower and broader than the cinnamic acid trial, the unknown is still probably cinnamic acid, not benzoin." It's extremely important to explain using your own data, and specifically explain how you decided which unknown you had, or what your results mean, as well as how you ruled out other unknowns or other options.
- It is totally fine, even encouraged, to mention any uncertainty you have in your results. If your results are a bit ambiguous, or there was some flaw you noticed in your experiment, or you are having trouble deciding which of two unknowns you have, please do mention that. You should still estimate a final answer, and explain why you're leaning towards that option, but you can definitely say that you're still unsure.

### Formal Lab Reports:

Everything above still applies! But there are some extra things to consider, and an overall format to follow. Here are the sections to include in your lab report, and what to include in each part:

- Introduction
  - Basically just the objective. This should briefly say what you're doing, and what you're trying to find out. No more than several sentences.
- Experimental
  - This part reiterates the chemicals/equipment you used, and the procedure. Since you already did this in your lab notebook, you can just copy over what you already wrote there, or even summarize it. Also, to keep it brief, I won't require you to include the safety information for everything. (I want you to be aware of the safety stuff before you do the experiment. Afterwards, it's not as important.)

- Results
  - This is really where the main part of the report begins. Results, Discussion, and Conclusion are the parts you should pay the most attention to. In Results, you should list your raw data and/or observations, without yet interpreting them. In other words, say what happened, not yet why. In some labs, it can even work fine to list the results in a table. For instance, you might say, “After recrystallizing, we obtained a flaky white powder, which had a melting range of 119-121 °C (calibrated).” Or, “The Schiff test showed a purple or fuschia color, indicating a positive result.”
- Discussion
  - This is where you interpret and explain your results as best you can. (This is often the single longest section of the report.) Explain what each result or piece of data means, and try to bring all the data together to say what your final answer or conclusion is. Also, this is where to include any doubts or conflicting data. If some data/observations are contradicting others, say so, try to estimate which is correct, and explain why you thought so. For instance, “Our compound’s melting range of 119-121 °C, is very close to benzoic acid’s literature melting point of 122 °C, so we can say that it is most likely benzoic acid. Since our melting range is also very narrow, only 2 degrees wide, we can be confident that our sample is relatively pure benzoic acid.” Or, “Since the Schiff test was positive, we can be fairly confident that our unknown is an aldehyde. Schiff tests sometimes give false positives or false negatives, but since our other tests also indicate that our unknown was an aldehyde, this is probably correct.”
- Conclusion
  - Briefly summarize your results and discussion. This should be fairly short, usually no more than one or two paragraphs. Think of this as the “TL;DR” version of Results and Discussion, as if someone in a hurry has no time to read the whole report, and just wants to know what your final answer is, and a couple broad reasons why you think so.

One last note: there is a tradition in scientific writing to use passive voice. That is, instead of saying “We performed the experiment, and we got an orange solid”, you would say “The experiment was performed, and an orange solid was obtained.” Most schools and professors in the future will penalize you to some extent if you don’t use passive voice. I think it’s a bit silly, and I won’t require it in my lab, but feel free to practice using passive voice in your lab reports if you expect to write more lab reports in the future. But also feel free to just explain your results in ordinary language. As long as you explain clearly and specifically, I’ll be happy.