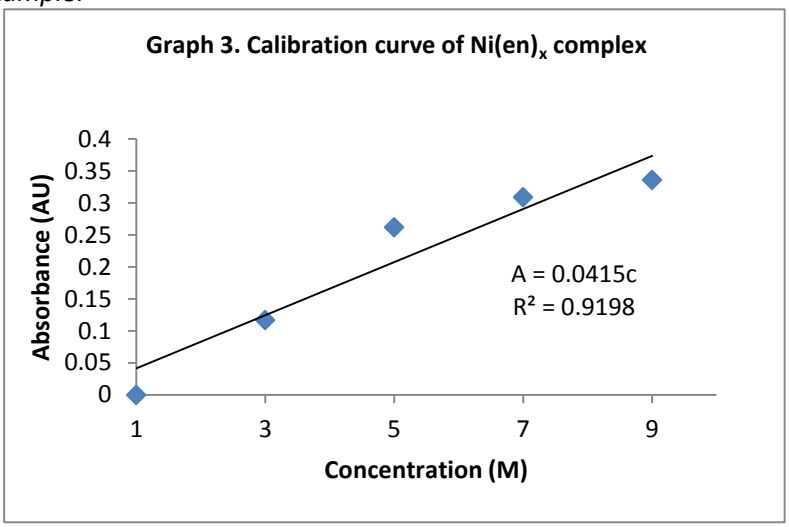
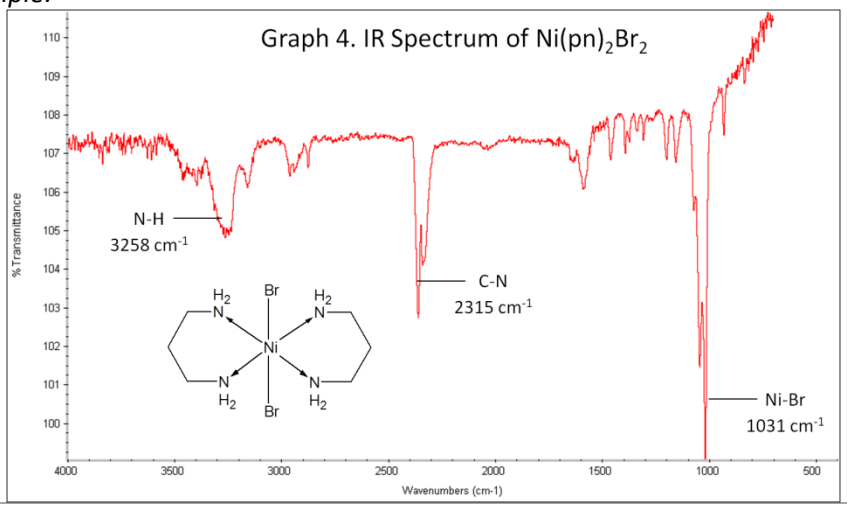
Lab Report Writing Guide CH 431 2012

I. Title	Include the course name, title of the experiment, your name.
II. Abstract	Concise summary of relevant results and outline of experiment, omitting procedural details.
III. Introduction	Describes the experiment, provides background, and puts the experiment in context. Answers the question "why are we doing this?" in reference to the purpose of the lab in general and the specific techniques applied (with a background introduction to each technique). Should include multiple external references.
	Show balanced chemical equations in the proper format, centered, and numbered to the side For example: $Mg(s) + Cl_2(g) \rightarrow MgCl_2(s)$ (1)
IV. Experimental Method	Include a table of hazards for each chemical used in the experiment (you can find this information by looking up the MSDS). Write out the procedure *performed* such that it could be followed by a competent chemistry student. Beware of having too much or too little detail—use your best judgment.
	Write connected paragraphs with complete sentences No numbering of steps No separation by days or other arbitrary distinctions
	Give enough information For example: Write out the volumes or mass of chemicals used to make a solution. This is especially important if you calculated these values prior to performing the experiment.
	Leave out extraneous detail For example: The exact size of the beaker "The student did…" "The TA said…" "Gloves and goggles were put on…"
	Do not copy the procedure exactly Think about what you did and condense it into a logical sequence using your own words.
Calculations and Yield	Follow the experimental method with examples of each type of calculation performed. For experiments where a substance was synthesized, yield calculations should also be included. The theoretical yield is the amount of product created under ideal circumstances. It is calculated by: 1) finding the limiting reagent by comparing the number of moles of each reactant 2) computing the number of moles of product expected if the reaction went to 100% completion based on the limiting reagent 3) converting moles of product to mass of product The actual yield is the mass of product that was actually produced. Percent yield comes from dividing the actual by the theoretical yield and multiplying by 100%.
V. Results and Discussion	Interpretation and comparison of data and key findings. Points out the features and limitations of the experiment and incorporates an explanation of errors and of the quality of the data and results. Most importantly, answers the questions "what do these results mean?" and "does this make sense?" Discussion questions should be answered in this part of your report.

	This section should generally be the longest part of the report.
	Talk about all important raw data and results For example: Applied resistance and observed current are important data. Spectra or product yields are significant results of an experiment.
	Leave out irrelevant information For example: Intermediate values in calculations can be excluded. If a titration was performed multiple times to get an average volume from which the concentration of an unknown was calculated, those two things should be included and discussed in this section. The initial and final volumes recorded in your lab notebook and even the individual titration volumes from which the average was calculated are trivial.
	Any tables, graphs, or spectra should be discussed in this section
	Don't reference notebook pages
	If comparing values, give both numbers and state the contrast numerically using percent difference or percent error
	If the results do not make sense, explain why and give a reasonable suggestion for future improvement For example: If percent yield was low, think about where you might have lost product—did the reaction go to completion? Was the product still partially dissolved in the solvent? Did you spill it?
	Work discussion questions smoothly into writing Do not separate questions into secondary section Do not type out the question Do not number the answers
VI. Conclusion	Contains a brief statement about whether the purpose of the experiment has been achieved or not and what was learned. A summary of the most important results will help support your findings.
	No new information should be presented
	No redundant redundancies
	Do not write about skills introduced or practiced while performing the experiment For example: "The students learned to take and analyze a GC spectrum" does not explain what was learned about the chemistry involved.
VII. References	All information from external sources must be referenced. *If you do not cite your work it is plagiarism*. Each report must include at least three sources.
	Use proper ACS format In-text citations should be indexed in order of initial usage in the report using a superscript number[1]. The reference list at the end of the paper should follow the conventional ACS format and also be listed in order of initial usage*, i.e.* D. M. Adams; P. J. Chandler. *J. Chem. Soc. A* **1967**, pg. 1009-1013.
	Reference scientific sources Textbooks and the *Journal of Chemical Education* are good background sources for students at your level, but try to incorporate more technical journals as well. Wikipedia or random websites are unreliable sources.

	Paraphrasing and summarizing are better than quoting in technical writing
VIII. Notebook	Include carbon copies of all notebook pages with observations/data taken during that lab. Staple to back of typed papers.
	Only attach lab notebook papers Do not write information on scraps of paper, computer paper, line-ruled paper, napkins, *etc.*
	Write neatly and clearly so that another person can both find and follow the logical sequence of your thoughts
Organization and Writing Skills	Write using formal writing skills.
	Avoid misspellings and bad grammar.
	Write in complete sentences with finished thoughts and paragraphs.
	Reports should be written in 3rd person passive voice, and generally in the past tense.
	Try to avoid overly dramatic social or philosophical statements. It's important to convey the importance of your work to the reader, but don't leave them rolling their eyes. *For example:* *"The future of humanity depends on the valiance of scientists across the world who have dedicated their life's blood to glorify polymers."*
	Chemical names are not capitalized within a sentence. *For example:* *carbon, not Carbon* *acetylnitride, not Acetylnitride*
	Observe the proper suffixes for Latin words. Exceptions are words like "data" which are understood to reference both singular and plural objects in vernacular speech. *For example:* *There is a spectrum, but multiple spectra. There are no such things as "spectrums".* *"This data is", or "these data are", are both acceptable. Even though it is technically correct, when was the last time you saw someone write "datum"?*
	Never start a sentence with a number or formula.
	Use superscripts and subscripts where expected.
	Formatting should be consistent.
Values and Units	Use correct units
	Use correct significant figures
	Use correct symbols for units *For example:* *mL, not milliliters* *Ω, not ohms*
	There should be a space between the value and the unit *For example:* *5.467 g, not 5.467g*
	Percentages do not have specific units and should be presented without space between the value and percent sign. *For example:* *66%, not 66 %* *66%, not "66 percent"*
Tables	Label as "Table #. Descriptive title." Place units with section heading using proper symbols.

<table>
<tr><td></td><td>For example:
Table 2. Linear relationship of decreasing current with resistance
<table>
<tr><th>Resistance (Ω)</th><th>Current (mA)</th></tr>
<tr><td>10</td><td>17.7</td></tr>
</table></td></tr>
<tr><td rowspan="5">Graphs/ Spectra</td><td>Label as “Graph #. Descriptive title.”</td></tr>
<tr><td>Label axes clearly with title and corresponding units. Include a legend, if needed, or delete if not.</td></tr>
<tr><td>Zoom in on relevant area</td></tr>
<tr><td>We usually use unconnected scatter plots to make the graph and then fit a trend line to the data. If using a trend line, display the equation of the line with x, y replaced by the proper equation variables. Add the R^2 too.
For example:
 
</td></tr>
<tr><td>All spectra or data printouts (i.e. IR or UV-Vis) should be labeled the same way as graphs and include the name of the compound being investigated and generally a drawing (many be hand sketched) of the chemical structure.</td></tr>
<tr><td>On an IR spectrum, each peak should show the frequency and identify which structural component is responsible for that peak.
For example:
 
</td></tr>
</table>

Figures	Label as “Figure #. Descriptive title.”
	Imbed in body of text (not attached on a separate piece of paper). Figures can be hand-drawn if necessary.