Chem 2229 – Formal Laboratory Report Guidelines Overview

*****IMPORTANT**: EACH STUDENT MUST PRODUCE THEIR OWN ORIGINAL REPORT. DO NOT COPY TEXT, TABLES, GRAPHS, ETC. FROM ANY OTHER STUDENTS CURRENTLY OR PREVIOUSLY IN CHEM 2229. *******

Format

Paper – 8 ½ by 11 white, print to one side, staple top left
Font – Times New Roman 12 point font
Spacing – Double Spaced
Paragraphs – Indent ½ inch, do not put blank line between paragraphs
Margins – 1 ¼ inch margins (*Microsoft Office Word default*.)
Page Numbers – Top Right Along with Last name

1. Go to Insert - Page Number- Choose Top Right
2. Go to View – Header / Footer – Type Last Name to the left of the page Number

Sections – Label each section with the specific header in boldface font.
Headers – Times New Roman 12 point font, bold face

Outline (*for specifics see "Sections" on the next page*)

Title Page
Abstract
Introduction
Experimental Methods
- Equipment
- Chemicals
- Procedure
- Hazards

Results and Discussion
Conclusions
References
Appendices

Editing

Autocorrect – *In Word under the File Tab choose the tab "Options" then "Proofing" then "Autocorrect Options" where there is an additional button labeled "Autocorrect Options*."

Turning off the following options often makes it easier to type a chemistry report.

1. Correct TWo INitial CApitals – that way it won't alter HCl to Hcl
2. Capitalize first letters of sentences
3. Capitalize first letters of table cells
4. Correct accidental usage of cAPSLOCK

Autoformat – *Also under the button labeled "Autocorrect Options" there is a tab marked "Autoformat."*

These may or may not affect your typing and so might be things you would want to turn off.

1. Automatic bulleted lists
2. List styles
3. Other paragraph forms

Spell-check / Grammar check – *In Word under the "Review" tab there is a tab "Spelling and Grammar"*
*(**Note:** When writing it is best to first write down everything you want to say, then go back and correct the grammar and the spelling later. Otherwise it is very easy to lose your train of thought and miss key components of what you intended to say.)*

1. Always run a spell-check/grammar check before submitting a paper; however, do not rely on spell-check/grammar check to catch all errors. Sometimes it is easier to have a friend or your lab partner read over the paper to catch any mistakes.
2. Commonly misspelled and/or misused words:
   a. **Affect / Effect**
      affect – *verb* to produce an effect on; to influence or impress.
      effect – *noun* result; meaning or intent.
   b. **Attain / Obtain**
      attain – *verb* achieve or accomplish; to arrive at or reach.
      obtain – *verb* to gain by planning or effort.
   c. **Ensure / Insure**
      ensure – *verb* to guarantee.
      insure – *verb* to give, take or procure an insurance on or for.
   d. **Vial / Vile**
      vial – *noun,* a small container, typically cylindrical and made of glass, used especially for holding liquid medicines.
      vile – *adjective*, extremely unpleasant; morally bad; wicked.
   e. ***e. g. / i. e.***
      e.g. – *abbreviation* for the Latin phrase "*exempli gratia*" – "for example." It is used when you want to give an example of something you just mentioned.

      Latin abbreviations are commonly used when writing papers. (*e.g.*, *ibid*. is the abbreviation for the Latin word "*ibidem*" meaning "in the same place" and it is often used in bibliographies when an entry is the same as the previous one.)

      i.e. – abbreviation for the Latin phrase "*id est*" – "that is." It is used when you want to say the same thing in a different way. (*i.e.*, It is used when you want to reiterate the point another way.)
   f. **TLC strips** should not be referred to as TLC's, but as "TLC strips."
3. **Grammar** *(**Note:** Parts of the paper may be written in the passive voice. Grammar check will try and convince you that this is incorrect. Do **not** believe grammar check. Leave the passages in the passive voice.)*
   a. Use **Third Person / Passive Voice / Past Tense**
      1. The directions for experiments are often given in the Imperative Mood. You will need to convert them from the Imperative to Indicative mood / Third Person / Passive Voice / Past Tense. Examples are shown below.

Original: Place ~ 220 ml of distilled water and a stir bar in a 600 ml beaker on a hotplate.

Converted: Approximately 220 ml of distilled water and a stir bar were added to 600 ml beaker on a hotplate.

   b. Do ***not*** use contractions.
      (*i.e.*, Don't use "don't," use "do not" instead.)

c. Whenever possible, avoid using negative sentences – avoid using the word "not."

Original: Crystals did not form until the beaker was placed in the ice bath.

Converted: Crystals formed once the beaker was placed in the ice bath.

d. Do ***not*** start sentences with numbers.

Original: 1.0 ml NAOH was added to the beaker.

Converted: One milliliter of NAOH was added to the beaker.

Depending on the degree of accuracy of the instrument used to measure the 1.0 ml, either of the following statements would also be acceptable:

Converted: Approximately 1.0 ml NAOH was added to the beaker.

Converted: Exactly1.0 ml NAOH was added to the beaker.

e. When referring to upcoming data, verbs of being should not be followed by a colon.

Original: The list of chemicals is:

Converted: The chemicals are listed in the table below:

Converted: The chemicals are listed as follows:

f. Pronouns that are used as antecedents by definition refer back to a previously stated noun. If a pronoun seems ambiguous, restate the noun instead of using the pronoun.

For Example: The HCl was added to the beaker. It was placed in a hot water bath.

Does "it" refer to the HCl or the beaker? In this case it would be better to state the intent clearly rather than using the word "it."

Converted: The HCl was added to the beaker. The beaker was then placed in a hot water bath.

g. Milliliters is plural except in the case of one. If you abbreviate milliliters as ml, grammar check does not realize that it is plural and want you to change to a singular verb. *Ignore grammar check!*

Correct: Approximately 2 ml of 3M HCl ***were*** added dropwise to the solution.

Grammar Check: Approximately 2 ml of 3M HCl ***was*** added dropwise to the solution.

Again – "Ignore Grammar Check." If in doubt read the sentence aloud that grammar check is trying to change. At which time you should hear the "s" in milliliters and realize the plural form of the verb "were" should be used.

h. If two singular subjects are combined using the word "and" then the subject is automatically plural and a plural form of the verb is mandatory. If two singular subjects are combined with the word "or" then the subject remains singular and a singular form of the verb should be used.

i. Avoid personification.

Original: The beaker was inclined to get hot.

Converted: The beaker was heated.

j. Avoid overuse of the word then. Reserve its use for if-then statements. If in doubt about how often you used the word, type "then" into the Find tab. If you have formed a lot of run-on sentences, just by using the linking word "then," you should probably eliminate some of them and make smaller shorter sentences.

Grammar – Verb Review:

Verbs are dependent on Mood, Voice, Tense and Person.

Person:

Person either refers to singular or plural, 1st, 2nd or 3rd person.

	Singular	**Plural**
First Person:	I am pouring the chemical.	We are pouring the chemical.
Second Person:	You are pouring the chemical.	You (*all*) are pouring the chemical.
Third Person:	He (she or it) pouring the chemical.	They are pouring the chemical.

Mood:

There are three moods: Imperative, Indicative and Subjunctive.

Imperative is used for commands. Pour the chemical into the beaker.

In this case the 2nd person is implied. (*You should*) pour the chemical into the beaker.

Indicative is used for statements and questions.

Statement: He is pouring the chemical into the beaker.

Question: Is he pouring the chemical into the beaker?

Subjunctive is used for conditional statements (*e.g.*, if /then statements).

If the pH were too low, then he would have added more NaOH to the solution.

If I were a rich man, then I wouldn't have to work hard.

(*Note that the verb of being is plural even though the subject is singular.*)

Voice & Tenses:

There are two voices: active and passive. There are six tenses: present, imperfect past, future, present perfect, past perfect and future perfect.

Active Voice (*the action is being done by the subject "dog"*):

In the following tenses, there is a sense of ongoing action.

Present:	The dog is burying the bone.
Imperfect Past:	The dog was burying the bone.
Future:	The dog will bury the bone.

In the following tenses, there is a sense of completed action.

Present Perfect:	The dog has buried the bone.
Past Perfect:	The dog had buried the bone.
Future Perfect:	The dog will have buried the bone.

Passive Voice (*the action is being done to the subject "bone"*):

Present:	The bone is being buried by the dog.
Imperfect Past:	The bone was being buried by the dog.
Future:	The bone will be buried by the dog.
Present Perfect:	The bone has been buried by the dog.
Past Perfect:	The bone had been buried by the dog.
Future Perfect:	The bone will have been buried by the dog.

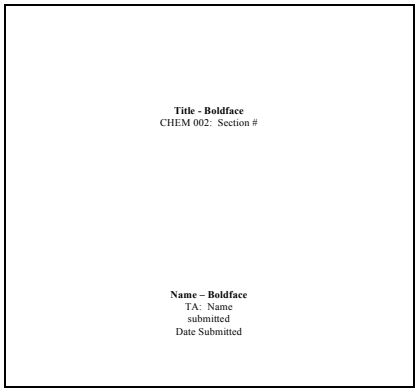
Sections:

Include headers for each of the identified sections.

Title Page:

Information should be centered left to right. Title of the report should give a brief description of the work Your title page will look similar to the format on the right.

Title - Boldface
CHEM 2229: Section #
13 spaces
Name – Boldface
TA: Name
submitted
Date Submitted



Abstract (*limit 500 words*):

This is where you summarize your work as clearly and concisely as possible. The abstract needs to contain all of the **key chemicals** and **key concepts** in this paper. *What chemicals were used? What types of reactions occurred? What procedures / instruments were used to verify the results?*

The reason the abstract needs to be clear and concise is that most journals limit the number of words that the abstract can contain. Likewise, some of the abstract compilers limit the number of words shown in an initial search window. If the abstract is too wordy, then it is merely truncated at the limit. The process is often automatic. No one takes time edit them or to see that they still make sense in this truncated form and the initial search only pulls words from the truncated version. So it is to the author's advantage to write an abstract in the **"pyramid" format** in which the most important information is given first and additional information follows. In other words, do ***not*** use the inverted pyramid format that is required for most essays. With the inverted pyramid format, the author baits the reader with a provocative first line and then reels the audience in slowly by giving lots of details that hint at the end result without actually stating it. In this manner, he saves the most important facts and the result for the last big haul in order to keep his audience's interest peaked. If the abstract is written in this way, then the author's brilliant summation may be lost forever when the abstract is cut down to format size.

The abstract is ***not*** merely a reiteration of the introduction. It should ***not*** contain historical references, unless the author is specifically trying to reproduce another researcher's results. It should ***not*** contain a detailed description of how the key concepts are applied; ***nor*** should it contain a detailed description of the procedure. These details need to be saved for the "Introduction" and the "Experimental" sections, respectively.

Introduction:

This is where you explain why someone would want to do this experiment. You will want to refer to other authors who have done similar work in the field in order to give your work some historical context. *What were those authors hoping to achieve? What is the purpose of your work? How does your work differ from theirs? Why is your work cutting edge?* You must reference whatever information you use. If you actually cite the information, then you must note this in the text. *See References*.

Experimental Methods:

This section should be broken down into the following subsections: Equipment, Chemicals, Hazards and Procedure.

Equipment: This is where you list the equipment used including the specific make and model of instruments (MP, TLC, FTIR, NMR) used.

Chemicals: This is where you list the chemicals used. This may be similar to a prelab table.

Hazards: This is where you note any hazards. If the only hazards are associated with the chemicals and you have them listed in a table, then they do not need to be restated. However any precautions that need to be taken should be noted here. For example, if nitrile gloves were worn to avoid contact with certain chemicals.

Procedure: This is where you describe the hypothesis and the procedure that was followed. It needs to be detailed enough that if someone else wanted to repeat the experiment later, they could do it based on the information you have written here. Don't forget to include any changes made to the lab procedure and any observations you made during the experiment. *What previous works were used as models? What variables were altered / controlled? How was the experiment performed? What instruments were used to characterize the chemical products? What methods were used to ensure that the data was valid?*

Because there were three steps to this experiment you might want to have subheadings for each step. Include all applicable chemical equations. Address any other prelab questions. Describe the procedure in enough detail that someone who wanted to repeat the experiment could follow your directions.

Chemical Equations – All relevant equations need to be listed, discussed, and numbered for this experiment. The equations need to be centered and numbered sequentially. (Note: Arrows can be found under "Insert – symbol – (normal text)"). For example

$$PV = nRT \qquad (1)$$

$$2\ H_{2\ (g)} + O_{2\ (g)} \rightarrow 2\ H_2O_{\ (aq)} \qquad (2)$$

Also, if there is a section of the procedure that was not performed by you (the experimenter) specifically, but it was included in the original write up, it should not be included in the main body of the experiment as if you had actually performed it. Instead it should be footnoted or included as an "if this had occurred. . . then this action would have been taken" type of statement.

Again don't forget: The procedure needs to be in the **3rd person, passive voice, past tense**. That means *write*

The 25 ml of HCl were poured into a 150 ml beaker.* (*Correct*)

instead of ***(1st person, active, present)***

I am pouring 25ml HCl into a 150 ml beaker. (*Incorrect*)

Also ***avoid the imperative*** *mood. That means do not write*

Pour 25 ml of HCl into a 150 ml beaker. (*Incorrect*)

***Note**: Grammar check does not understand the abbreviation ml as plural. If you have 1 ml use "1 ml was added", for any other number "2, 5, 250" make sure you use the phrase "were added". Grammar check will want to correct this to "was" – choose the ignore rule option.

Results and Discussion:

This is where you need to include your tables and graphs of the data that you collected and the calculations that you made. The discussion needs to include any descriptions of physical properties; any discrepancies in the data; and, any errors that could be avoided the next time the experiment is performed.

Don't forget to include information about the products (including percent yields) and how they were characterized. You will need tables to include tables for the melting point, TLC, FTIR and NMR data. For the TLC data be sure to note the Rf and the theoretical plates for each sample and the knowns. For the FTIR and NMR you should list major peaks and identify their significance. You should compare your data to the literature data and calculate percent errors. The discussion needs to include any descriptions of physical properties; any discrepancies in the data; any anomalies noted in the data; and, any errors that could be avoided the next time the experiment is performed.

Tables – All Tables need numbers and titles. All columns and rows need subtitles that include units. The tables are not considered figures and should be numbered independently of the figures in a sequential order: Table 1, Table 2, etc. **Information in the tables needs to be discussed in the text as well**.

Units – Always give units even in Tables.

****Note** – Tables and Graphs should not overlap from one page to the next. If you cannot fit the table / graph onto one page, insert a break after the last paragraph of text on the first page: "Insert – break – page break". This will force the table / graph onto the next page.*

Conclusion

This is where you explain how well the experiment went. *Did you succeed in making the products you intended to make? Does your evidence support your conclusion?* Discuss more thoroughly any errors made in the experiment. *What types of things in the procedure might lead to errors.* Discuss anything that went particularly well. Explain why you think the experimental data was acceptable or not. Finally discuss any suggestions you have for future experimenters. These conclusions need to be supported by the data you collected.

References:

*(**Note:** At the very least, you need to include all of the references listed in the handouts: Vogel, Neha and Manisha Patni and William Kofie, et al. You should probably also reference any alterations to the original procedure that were made by Dr. Bone.)*

If you actually cite the information, then you must note this in the text with quotation marks around the cited material. If you paraphrase information, you must cite it as well unless it is considered common knowledge. Common knowledge is generally considered information that can be found in 5 or more sites. Sometimes it is easier to cite the paraphrase than it is to confirm that it is common knowledge and list the 5+ sites where you found the information. **Parenthetical notation** may be used. List the author's last name and page number. The last name then will correspond to a listing in the references section. For example:

> "Prior to Guttenberg's invention of moveable type, Medieval mankind was forced to rely on a collective societal memory as a resource. The elderly were respected and revered for they had lived through significant events and their recounts of these events were relied upon as facts." (Burke 93)

Works Cited

Burke, James. The Day The Universe Changed. Boston: Little, Brown, 1995.

References can be listed as "Works Cited" and/or "Works Consulted". For this paper the MLA format for references is preferred.

Appendix:

Attach all yellow sheets and all collected data (TLC strips attached to either a yellow sheet or typing paper, FTIR & NMR printouts). The Appendices can be A, B, C or 1, 2, 3. In the text, whichever information you refer to first goes in Appendix A, second B, etc. The yellow pages will go at the end of the report in the last appendix. For example:

Appendix A (or 1) – Calculations: Your sample calculations may be typed or written neatly in ink.
Appendix B (or 2) – TLC Plates
Appendix C (or 3) – FTIR Printouts
Appendix D (or 4) – NMR Printouts
Appendix E (or 5) – Raw Data: Your yellow sheets with your raw data and TA signature.