Use the following guidelines to set up and complete science lab reports:



**General Criteria**

***Lab Reports must be completed by EACH student INDIVIDUALLY. It is an assessment grade.***

**Check the word document settings on your computer:**

* 12 point BLACK Times New Roman or Arial font for text … Larger font for titles & headings are permitted but not necessary. Avoid color.
* 1 inch margins … headers and footers are professional and appropriate
* Standard spelling and grammar rules (use your software’s review function)
* Single space whenever appropriate.
* **General instructions**
* This is a technical document, NOT an English essay or short story.
* **Be Concise**. In scientific writing, it is important to say as much as needed while using as few words as possible. Lab Reports should be thorough, but repetition should be avoided. The entire report should be clear and straightforward.
* Avoid using Personal Pronouns (“I”, “My”, “You”). Use impersonal pronouns (“one”, “it”).
* Refer to the **Grading Rubric** when working on your lab report
* The following is a good website about academic writing instructions: <http://unilearning.uow.edu.au/academic/2div.html> .

A. Write a Proper **heading** (2 %):

######  *Name (upper left) Chemistry (upper right)*

 *Date Teacher, Section, & Time*

B. **Report / Write-Up Components**

**Title** (2 %) Place the **title** of the lab at the top center of the page leaving one space below the heading. The title should be descriptive. Do not simply state “Lab 1”.

**Introduction**

* Write: “**Introduction**” at the left margin leaving one space below the “Title”.
* This statement introduces the topic and/or objectives for the lab.
* Write: “**Purpose**” one space below the “Introduction”. (Indent from the left margin under the Introduction and leave one space below the “Introduction”.)
* Describe what the lab is intended to accomplish, what is the **question** at hand, or what is the **problem** to solve.
* Write: “**Background Information**” (Indent from the left margin as with Purpose and leave one space below the “Purpose”.)
	+ Include any **background information** pertinent to your topic of study. This would include the major Chemistry concepts you are studying.
	+ Define any major Chemistry terms that relate to the purpose of the lab (e.g. mass, density, specific heat, etc.).
	+ Use outside resources (e.g. journals, websites, Chemistry related books, the text) but do not copy verbatim when explaining the science, use your own words. (You must also cite all references that you use, and include in the bibliography).
* Write: “**Hypothesis**” (Indent from the left margin as with the Purpose and background information, leaving one space below the “Background Information”.)
	+ Include the **hypothesis** you plan on testing for this lab. A hypothesis is an “educated” guess based on observation of what you expect the experiment to show. Therefore, there must be some reasonable explanation provided with your hypothesis. Use “if – then – because” statements when possible.
* There are three aspects of the “Introduction” section: (1) stating the purpose by addressing the question/problem, (2) giving background information and defining terms, and (3) stating your hypothesis by predicting what will happen during the lab.

**Equipment**

* Write: “**Equipment**” at the left margin leaving one space below the “Purpose” section.
* LIST all of the equipment and materials that you used in the lab.
* This section should be in list form whenever appropriate (not a paragraph).
* If you made any substitutions for the equipment listed in the text or lab worksheet, provide a complete list of any equipment or chemicals that you substituted in the experiment.
	+ For example, if the procedure calls for the use of a beaker, and you used a normal drinking glass, you would insert the following statement. “A drinking glass was substituted for the beaker.”

**Procedures**

* Write: “**Procedures**” at the left margin leaving one space below the “Materials”.
* If the procedures are provided, **summarize** the given procedures in your own words using **numbered steps**. Do not copy given procedures word for word, but you must reference your source.
* If the procedures are provided and the teacher instructs you to use them “as is”, you do not have to reword, but you do need a reference (see next step):
* Write: “*Refer to the [name the lab sheet or source by title] or text page [give text title, author, page] for detailed procedures*.”
* If procedures are not provided or if you need to include additional procedures, write **step by step**, numbered procedures showing a complete chronological summary of what was done in the experiment.
* Use the passive voice and write in the third person throughout the lab report. Strive to be as objective as possible.
* Example:

1. A dry 25 mL graduated cylinder was weighed to the nearest 0.01 g.

2. About 15.0 mL of distilled water was added.

3. The exact volume of the water was recorded to the nearest 0.1 mL and the mass of the cylinder and water was measured to the nearest 0.1 g….

* This section should enable someone at your level of scientific understanding to perform the same experiment.

**Calculations and Data**

* Write: “**Calculations and Data**” at the left margin leaving one space below the “Procedures” section.
* Include **detailed observations** of what you experienced or observed in the lab: what you saw, heard, smelled, etc. when the experiment was performed. However, do not retell procedures in this section.
* Answer any **questions** specifically included in the Calculations and Data section, numbering the questions and supporting the answer with data from the lab.
* Do NOT include inferences, explanations, and/or conclusions in this section unless needed for questions in this section. These should be included in the Conclusion section of the lab.
* Include or create data tables and/or charts to organize and support your observations. Label all items and/or categories (e.g. units, titles).
* Provide an organized **table** of all measurements taken during the lab activity.
* The table must have clear headings.
* All measurements must include the units used for each measurement.
* The table should be arranged in an orderly fashion that makes it easy for someone reading it to be able to quickly compare different trials, and grasp the scope and outcome of the experiment.

Here are two examples of correctly done tables for different experiments:

Specific Heat of Substances

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Substance | Final TempTf | Initial TempTi | ΔT | Mass | Specific Heat | Heat (q) |
| Metal | 30.0 °C | 100.0 °C | -70.0 °C | 52.4 g | 0.41 J/g°C | -1500 J |
| Calorimeter | 30.0 °C | 28.9 °C | 1.1 °C | 7.8 g | n/a | n/a |
| Water | 30.0 °C | 28.9 °C | 1.1 °C | 329.0 g | 4.184 J/g°C | 1500 J |

Balloon Expansion

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Trial | Volume Vinegar(mL) | Mass Baking Soda (g) | Circumference of balloon (cm) | Moles of acetic acid in the vinegar | Moles of baking soda | Limiting reactant in this trial |
| 1 | 250 ml | 10.0 g | 45.0 cm | 0.208 mol | 0.119 mol | Baking soda |
| 2 | 250 ml | 30.0 g | 58.0 cm | 0.208 mol | 0.357 mol | Acetic acid |
| 3 | 250 ml | 60.0 g | 63.8 cm | 0.208 mol | 0.714 mol | Acetic acid |

* Include a **picture/drawing/sketch** of major aspects of the experiment with a detailed explanation, showing the relevance of the image to the lab (2 minimum).
* Include any calculations, showing equations/formulas used and all the steps of the calculations along with the correct units.
* **IF the lab directions require a graph:**
	+ Plot the independent variable on the x-axis and the dependent variable on the y-axis.
	+ Label the graph (title, axes) and use equal intervals on both axes (with units).
	+ **Analyze the graph(s) and explain it in paragraph form** after the graph

1) State any relationship observed from the graph (*e.g.* *direct or inverse; if one variable increases what happens to the other factor?*).

2) Give evidence from the lab/graph that supports your analysis.

**Conclusions**

* Write: “**Conclusions**” at the left margin leaving one space below the “Calculations”.
* **Restate and address your hypothesis**
	+ Write “Address the Hypothesis” at the left margin leaving one space below the heading, “Conclusions”.
	+ *State* *whether your hypothesis was correct or incorrect in a complete sentence that includes the original hypothesis*.
	+ *Explain why your hypothesis was correct or not using your observations and data from the lab.*
* Provide **in-depth analysis** of the data and observations in the lab.
	+ Write “Analysis” at the left margin leaving one space below “Address the Hypothesis” section.
	+ Prove by the use of **data and/or supporting evidence** that you understand the principle(s) or concept(s) demonstrated in the lab. This is often an extension of the “Background Information” from the Purpose section. Use that content and concepts with evidence from the lab.
	+ Explain, utilizing scientific principles from the lab, why you got the results you did. Keep asking yourself “why” and “how” things worked as they did, thinking about the big picture: why this experiment and the results are important to science and how they are applicable to other fields.
	+ Use outside resources (e.g. journals, websites, chemistry-related books, the text) but do not copy verbatim when explaining the science, use your own words. (*You must also cite all references that you use, and include in the bibliography*).
* Answer any **questions** included in the lab by NUMBERING them and making statements USING COMPLETE SENTENCES that convey a complete scientific thought.
	+ Write “Questions” at the left margin leaving one space below “Analysis” section.
	+ Do NOT copy and paste the questions in the conclusion section, but reword them to make concluding statements based on the questions.
	+ You must also **provide** **supporting evidence** and/or data from the lab for each conclusion and conclusion question.
* Include **errors** (*human error, experimental error, materials, procedural errors*) that were encountered and note why these errors occurred and how the error changed the result.
	+ Write “Errors” at the left margin leaving one space below “Questions” section.
	+ Sometimes the labs are “too perfect” because the results were done previously. Consider potential errors that would be made in a real-life situation.
	+ You may also offer any ideas for relevant further study/research of this topic or scientific principle (this is optional).

**Bibliography**

* Write: “**Bibliography**” at the left margin leaving one space below the “Conclusions” section.
* Must be in APA format. The following websites are helpful in understanding the APA bibliography format:

http://owl.english.purdue.edu/owl/resource/747/06/

<http://owl.english.purdue.edu/owl/resource/747/08/>

* Alphabetize all sources.
* Do NOT indent the sources, but begin at the left margin.
* Leave ONE space between each source.
* Students must use parenthetical in-text notation for any information obtained from their research. This means putting the reference in parentheses immediately after the use of the information in your conclusion section. See:

<http://owl.english.purdue.edu/owl/resource/747/02/> for how to do this correctly.

* **You must use at least 2 non-textbook sources for all formal lab reports and include your textbook.**
* **You MUST include a minimum of three references (see samples below):**
* Reference for the sources used in the **Lab Report**.

"Air is Stuff--show me more". *How Things Fly*. 07 July 1997. Web. 17 Sept. 2004. <http://www.aero.hq.nasa.gov/edu/airmore.html>

* Reference used for lab directions or other information on **Learning CTR**.

Chemistry Course Site, Week 3. *Directions for Lab*. Learning CTR Online, n.d. Web. 9 Sept. 2020. <[www.learningctronline.com](http://www.learningctronline.com)>.

* Reference for your **Textbook** or other book resources.

Wilbraham, Antony C., et al. Pearson Chemistry. Upper Saddle River: Pearson Education, Inc., 2017. (Print or Digital?).

* + Citing a web search engine (google, yahoo, etc.) or a Wiki (Wikipedia) is NOT acceptable. Avoid encyclopedia resources because these are not accepted as scientific.