

LAB REPORTS: CRITERIA & GUIDELINES

PRE-LAB

Variables

- **Independent Variable:** Name the variable that is changed (manipulate) in the experiment and an explanation of how it is manipulated (including # of trials and increments).
- **Dependent Variable:** Name the variable that is MEASURED and explain how it is measured.
- **Controlled Variables:** List and describe all controlled variables.

Prediction(s)

Make predictions as specified by your teacher or in the lab handout. Make sure to **explain** any predictions you make (i.e. provide scientific reasoning to support them).

Procedure Flowchart

A flowchart is a series of steps that describe the method of the lab accompanied by simple diagrams to clarify procedures.

- **Detail:** Include all steps in your own words in a concise way. Make sure to include important quantitative information (e.x. amounts, concentrations, mass) and instructions for when/where/how to make/record observations.
- **Images:** Do not have to be artistic, but must be clear and easy to interpret.
- **Safety:** Include important safety information/warnings in **HEM format** as well as instructions for safe waste disposal.

Hazardous Materials (HEM)		
Sodium Hydroxide - NaOH	Hydrochloric Acid - HCL	Bromothymol Blue - C ₂₇ H ₂₈ Br ₂ O ₅ S
H: Corrosive, Irritant, Permeator E: Irritant, Corrosive M: Irritant, Corrosive	H: Corrosive, Irritant, Permeator E: Irritant, Corrosive M: Irritant	H: Irritant, Permeator E: Irritant M: Irritant

Data Table

A well-organized data table(s) should be prepared to record ALL quantitative data.

- Columns and rows should have headings and units of measurements, with uncertainty if applicable
- Individual trials and any columns for statistical analyses should be included

e.x.: Mass of product X produced over time during reaction between substances A and B.

Time(s)	Mass (grams) ± .01 gram			
	Trial 1	Trial 2	Trial 3	Average

LAB REPORT

GENERAL FORMATTING: Cover Page, Double-sided, 11 pt. font, single spaced, 1" margins, major headings underlined.

COVER PAGE: Title of lab (underlined), your full name, lab partner's name, class, block, teacher, date of submission

- The title of a report should indicate exactly what was studied. Example:

The Effects of Light and Temperature on the Growth of the Bacterium, Escherichia coli.

Abstract

The Abstract summarizes four essential aspects of the report: the **purpose** of the experiment (sometimes expressed as the purpose of the report), **key findings**, **significance** and **major conclusions**. The abstract often also includes a brief reference to theory or methodology. The information should clearly enable readers to decide whether they need to read your whole report. The abstract should be one paragraph of 100-200 words (the sample provided is 191 words).

Must have:

Purpose, Key result(s), Most significant point of discussion, Major conclusion

May Include:

Brief method & scientific theory

Restrictions:

ONE page & 200 words MAX.

Sample Abstract

This experiment examined the effect of line orientation and arrowhead angle on a subject's ability to perceive line length, thereby testing the Müller-Lyer illusion. The Müller-Lyer illusion is the classic visual illustration of the effect of the surrounding on the perceived length of a line. The test was to determine the point of subjective equality by having subjects adjust line segments to equal the length of a standard line. Twenty-three subjects were tested in a repeated measures design with four different arrowhead angles and four line orientations. Each condition was tested in six randomized trials. The lines to be adjusted were tipped with outward pointing arrows of varying degrees of pointedness, whereas the standard lines had inward pointing arrows of the same degree. Results showed that line lengths were overestimated in all cases. The size of error increased with decreasing arrowhead angles. For line orientation, overestimation was greatest when the lines were horizontal. This last is contrary to our expectations. Further, the two factors functioned independently in their effects on subjects' point of subjective equality. These results have important implications for human factors design applications such as graphical display interfaces.

LAB REPORT (cont.)

Results & Observations:

In the results, you present your observations and data with no interpretations or conclusions about what they mean. A well-written and well-organized results section will provide the framework for the analysis section.

- This is an overview of your **RAW Qualitative** (observations) and **Quantitative** (measurement) results.
(*raw data must be re-typed, but original papers should also be attached to the back of your report upon submission*)
- Quantitative data should be well-organized in a data table(s)
 - Columns and rows should have headings and units of measurements, with uncertainty if applicable
 - Individual trials and any columns for statistical analyses should be included
 - Title should be descriptive and underlined (title should describe exactly the data contained in the table)

e.x.: Mass of product X produced over time during reaction between substances A and B.

Time(s)	Mass (grams) \pm .01 gram			
	Trial 1	Trial 2	Trial 3	Average

- Highlights of your data can be emphasized by transforming it in some way to reveal or emphasize trends:
 - **Statistical analyses** like average, % change, etc. Include sample calculations if you do this.
 - **Graph(s)** that shows trends or patterns clearly. Graphs should be labelled & include a descriptive title.
***Only draw a best fit line if appropriate (to emphasize a mathematical relationship)*
- Qualitative data can be included in a table, paragraphs, or in the form of images or diagrams.

Experimental Progress

As you work, keep track of any procedures that you altered compared to the lab manual or published procedures. Also include any errors or abnormal results that you encounter.

Analysis & Evaluation

This is the most important part of your report, because here, you show that you understand the experiment beyond the simple level of completing it. Explain. Analyze. Interpret. Some people like to think of this as the "subjective" part of the report. By that, they mean this is what is not readily observable. This part of the lab focuses on a question of understanding "*What is the significance or meaning of the results?*" It should be a four to five paragraph write up that addresses the following components:

- **Interpret Results:** What does your data/results mean? What have your findings shown (refer to specific data to support your inferences), and how are they explained and supported by scientific theory?
- **Assess the hypothesis (if applicable):** Describe whether your original hypothesis was supported or rejected by referring to your findings.
- **Assess the validity of the method:**
 - Identify if your method was valid or not. A valid method allows for the collection of **precise** and **accurate** data.
 - Precise – Sufficient amount of data & how close measurements are to one another and/or to class data.
 - Accurate - How close a measured value is to a standard, expected, or known value.
 - Comment on experimental error. Was it avoidable? Due to equipment? Due to design of the experiment? How did it impact the validity of your test?
- **Suggest improvements or extensions to the method:**
How could the design of the experiment be improved to increase its validity? Offer future direction for your results or changes you would make the next time to produce results that are more significant or noteworthy.

Conclusion

Include a brief restatement of the purpose and the main results (including evidence to support them) and how they are relevant to the field of study and larger concepts.

Works Cited

Document any research you included or sources you used in MLA format.