**DESIGN LAB REPORTS: CRITERIA & GUIDELINES**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Criterion Category 2: Inquiring and Designing** | | | | |
|  | **(0)** | **Beginning (1-2)** | **Developing (3-4)** | **Accomplished (5-6)** | **Exemplary (7-8)** |
| **[i]**  **[ii]**  **[iii]**  **[iv]** | *I have not achieved a standard described to the right*. | *I am able to:*  **state** a problem or question to be tested by a scientific investigation  **outline** a testable hypothesis  **outline** the variables  **design** a method, **with limited success.** | *I am able to:*  **outline** a problem or question to be tested by a scientific investigation  **formulate** a testable hypothesis **using scientific reasoning**  **outline** how to manipulate the variables, and **outline** how **relevant data** will be collected  design a **safe method** in which he or she **selects materials and equipment**. | *I am able to:*  **describe** a problem or question to be tested by a scientific investigation  **formulate and explain** a testable hypothesis **using scientific reasoning**  **describe** how to manipulate the variables, and **describe** how **sufficient, relevant data** will be collected  design a **complete and safe method** in which I select **appropriate materials and equipment**. | *I am able to:*  **explain** a problem or question to be tested by a scientific investigation  **formulate and explain** a testable hypothesis **using correct scientific reasoning**  **explain** how to manipulate the variables, and **explain** how **sufficient, relevant data** will be collected  **design** a **logical, complete and safe method** in which I **select appropriate materials and equipment**. |

**Cover Page:** Title of lab (underlined), date of submission, name of teacher, your full name, class name, block

**GENERAL FORMATTING:** Double-sided, 11 pt. font, regular margins, major headings underlined.

**Problem/Question [B-i]**

* This is the question/objective that you are trying to answer by completing your experiment. It should be specific*.*
* Summarize any background information, concepts, or research that will help clarify the context of your question.

**Hypothesis**: **[B-ii]**

* This statement reveals the relationship you predict exists between what you’re manipulating (independent variable) and what you think will change as a result (dependent variable).
* Format: *“If \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, then \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.”*
* What you predict will happen in your experiment, and why you think it will happen, **using scientific reasoning**
  + Make sure your reasoning includes specific science that would support your prediction

**Variables & Data** **[B-iii]**

* Identify the Variables:
  + **Independent Variable**: Name the variable that you will change (manipulate) in the experiment and explain how it will be manipulated.
  + **Dependent Variable**: Name the variable that will be MEASURED and how it will be measured.
  + **Controlled Variables:** List all of the variables that you will keep the same throughout the entire   
     experiment and how you will keep them the same. (CONSTANT)
* Explain how sufficient (# of trials & increments) and relevant (types of measurements) data will be collected.

**Materials[B-iv]**

* List all of the specific materials (including sizes/quantities) that you will use in this experiment.

**Method**: **[B-iv]**

* Steps: Step-by-step instructions that logically and concisely describe how to complete your exact experiment.
  + Includes amounts *(e.x. add 20mL of water)* and instructions for when/where to make/record observations.
* Diagram: Includes a clearly labeled diagram(s) or image(s) of any apparatuses you will use “in action”.
* Safety: Includes important safety information/warnings.
* Ethical Considerations: Includes important ethical concerns of procedure or materials.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Criterion Category 3: Processing and Evaluating** | | | | |
|  | **(0)** | **Beginning (1-2)** | **Developing (3-4)** | **Accomplished (5-6)** | **Exemplary (7-8)** |
| **[i]**  **[ii]**  **[iii]**  **[iv]**  **[v]** | *I have not achieved a standard described to the right*. | *I am able to:*  **collect and present** data in numerical and/or visual forms  **interpret** data  **state** the validity of a hypothesis based on the outcome of a scientific investigation  **state** the validity of the method based on the outcome of a scientific investigation  **state** improvements or extensions to the method. | *I am able to:*  **correctly collect and present** data in numerical and/or visual forms  **accurately interpret** data and **explain** results  **outline** the validity of a hypothesis based on the outcome of a scientific investigation  **outline** the validity of the method based on the outcome of a scientific investigation  **outline** improvements or extensions to the method that would benefit the scientific investigation. | *I am able to:*  **correctly collect, organize and present** data in numerical and/or visual forms  **accurately interpret** data and **explain** results **using scientific reasoning**  **discuss** the validity of a hypothesis based on the outcome of a scientific investigation  **discuss** the validity of the method based on the outcome of a scientific investigation  **describe** improvements or extensions to the method that would benefit the scientific investigation. | *I am able to:*  **correctly collect, organize, transform and present** data in numerical and/ or visual forms  **accurately interpret** data and **explain** results **using correct scientific reasoning**  **evaluate** the validity of a hypothesis based on the outcome of a scientific investigation  **evaluate** the validity of the method based on the outcome of a scientific investigation  **explain** improvements or extensions to the method that would benefit the scientific investigation. |

**Results & Observations**:**[C-i]**

* This is an overview of your **Qualitative** (observations) and **Quantitative** (measurement) results.
* 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) .01 gram** | | | |
| Trial 1 | Trial 2 | Trial 3 | Average |
|  |  |  |  |  |

* Qualitative data can be included in a table, paragraphs, or in the form of images or diagrams.
* “Transform” raw data by modifying in some way to reveal or emphasize trends:
  + Do calculations (statistical analyses like avg, % change, etc.). Include sample calculations if you do this.
  + Create a graph(s) that shows trends or patterns clearly. Label it clearly and include a descriptive title.
    - Only draw a best fit line if appropriate (to emphasize a mathematical relationship)

**Analysis & Evaluation [C-ii, iii, iv, v]**

This should be a four to five paragraph write up that addresses the following components:

* **Interpret Results**: **[C-ii]**
* What does your data/results mean? What have your findings revealed (refer to specific data to support your inferences), and how are they explained and supported scientifically?
* Comment on the reliability of the data – were there any unexpected results or outliers?
* **Assess the validity of the hypothesis:** **[C-iii]**
* Was your hypothesis valid (was it validated by your results) or not? What proof (data) supports/rejects it?
* **Assess the validity of the method: [C-iv]**
* Is your data precise? (*Is there enough data? Is your data consistent? Are there any outliers? Why/why not? What sources of error were there in your investigation?* *Did you control for all extrinsic variables?)*
* Is your data accurate? (if applicable) *(does it agree with literature values?)*
* What were sources of error in your investigation? How did they impact the validity of your test?
* **Suggest improvements or extensions to the method:** **[C-v]**
* How could the method of the experiment be improved? Could you have obtained more accurate results? Fixed some of the invalid components from part C?
* What would you suggest for students doing this experiment next time; what more could you test?

**Works Cited**

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