Handout: Lab Write-up Format

In an attempt to explain and make predictions about the natural world, scientists "do science" where, using a process called scientific inquiry, they discover new knowledge by designing and conducting investigations and then report that knowledge to the world in lab reports. Use the following as a guide to assist you in designing your investigation and writing your lab report. The Roman numerals (**I, II, III**) designate the three main areas of scientific inquiry (**Design, Data Collection & Processing, and Conclusion & Evaluation**). Under each of these you will find capital letters (**A,B,C…**) that correspond to the particular sections (**Title & Heading, Question, Hypothesis, etc…)** you must write for your report. Under each of these you will find numbers (1,2,3…), letters (a,b,c…), and bullets (·) that give guidance on what these sections should include. Make sure you clearly label the capital lettered sections in your report (Title & Heading need not be labeled). Some sections require only a sentence ("Question" and "Hypothesis") or numbered list ("Procedure"). Other sections ("Background Information", "Data Analysis", "Conclusion", and "Error Analysis") should be written as flowing, separate paragraph(s). Finally, give consideration to how you format your report so that it is easy to read, takes on a neat appearance, and lacks spelling and grammatical errors. There are no size requirements for the report so long as all the criteria outlined below are met.

I. Design

A. Title & Heading

1. Your title is a single sentence or phrase that describes what you investigated.
2. Your heading is your name and/or your group's name, the name of the class, and the date.

B. Question

1. Question being tested. Needs to be:
   a. Well-defined
   b. Testable
   c. Measurable
   d. Controllable
2. Usually deals with altering one variable and measuring how another, presumably related, variable responds. (Example: "How will adding 1 cup of Miracle Grow to a cherry tomato plant every day for one week affect the number of cherry tomatoes it produces in a season?")

C. Background Information

1. Information you gathered about the subject of your investigation that will help you come up with a hypothesis.
2. This information can come from lecture, textbook, other references, personal observations, etc...

D. Hypothesis

1. Answer to your driving question that you expect to be true because of what you know (background information) about the subject being tested. Needs to be:
   a. Testable
   b. Falsifiable (able to be proved false)
2. Usually written as an *if…then* statement. (Example, "*If* I add 1 cup of Miracle Grow to a cherry tomato plant every day for one week, *then* the number of cherry tomatoes produced in a season will increase.")

E. Materials

1. List of materials and quantities used in conducting the investigation.

F. Safety

1. Relevant safety considerations to be taken into account while investigating.

G. Procedure

1. Numbered list of steps taken in conducting the investigation. Consider the following when writing this section:
   a. Design your procedure so that only the independent variable is altered, the response of the dependent variable is measured, and all other variables are controlled (you will need a control group to do this).
   b. Design your procedure logically and with enough conditions so that sufficient and relevant data is generated.
   c. Use enough detail so that someone else could reproduce your experiment exactly as you conducted it using only your procedure. This will require you to use quantities wherever possible.
   d. If a step is difficult to describe in words, consider a picture instead.
   e. Includes multiple trials.

II. Data Collection & Processing

A. Data Table

1. Useful, efficient, easily understood table (boxed rows and columns) in which to collect your data. Include title and column/row labels. Your data may be qualitative or quantitative, but only observations, not inferences. If quantitative, include units.

B. Data Manipulation

1. Manipulation of your data that makes the data easier to understand, that is, shows off any patterns better. Could take the form of any of the following (though a graph is usually preferred):
   a. A more organized data table.
   b. A data table that includes mathematical manipulation of data (averages, statistics, etc…)
   c. A graph (line graph)
   d. A chart (pie chart, bar chart)

C. Data Analysis

1. Summarize data
2. Identify any patterns, but don't yet draw any conclusions.
3. Mention any unusual results and/or outliers.
4. Show all computations, including equations used and results (show all of your work).

III. Conclusion and Evaluation

A. Conclusion

1. Should contain at least two well written, flowing paragraphs
   a. 1st paragraph: *Summary of the Experiment*
      i. The first should reiterate the purpose of the experiment, tell again the question driving the experiment, and state again your hypothesis. The 1st paragraph should answer the following questions:
         - What was the purpose of the experiment?
         - What was the question the experiment was trying to answer?
         - What was the hypothesis?

   b. 2nd, 3rd, 4th… paragraph: *Conclusion*
      i. The second paragraph should start by stating if your hypothesis was supported or disproven, then mentioning all the data you got from doing your experiment that supports your statement of "supported" or "disproven". The final sentence(s) should be the answer to the question driving the experiment. The 2nd paragraph should answer the following questions:
         - Was the hypothesis supported or disproven?
         - What specific evidence did the experiment give you (data & patterns) to support the answer to the above question?
         - What is the answer to the driving question of the experiment?

B. Error Analysis

1. List at least 3 sources of observed and/or experimental design error. For each, include:
   a. The error.
   b. How the error might have affected your results.
   c. What must be done next time to help fix the error.