Formal Lab Report Writing Toolkit for Grades 6-8

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Revised Summer 2013
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**Common Core WHST Standards** 30
Scientists tell others about their observations and explain those observations through lab reports. Without the lab report, experiments and observations would never benefit anyone other than the person who originally did the experiment. The goal of a lab report is two-fold. First, it uses evidence from observations to make claims about the world. Second, it gives enough detail so that another scientist can use the report to reproduce the experiment. By guiding new and innovative experiments, lab reports help to continue the search for knowledge.

When students conduct experiments and write lab reports, they have the opportunity to:

1. Increase their understanding of scientific and technological concepts.
2. Make observations, raise questions, and formulate hypotheses.
3. Design and conduct scientific investigations.
4. Analyze and interpret results of scientific investigations.
5. Communicate and apply the results of scientific investigations.

Using this document

This toolkit has been designed to assist students and teachers in successfully writing a formal lab report. It includes basic handouts for students and a breakdown of a lab report with examples that can be used by either students or teachers.

- Student handouts, indicated by a box at the upper-right of the page
  1. One Page Outline of a Lab Report
  2. Lab Report Helper Sheet and Graphical Organizer
  3. Lab Report Checklist
  4. Lab Report Rubric

- In-depth descriptions of each section of the lab report with examples. These sections may guide teacher instruction, or may be photocopied for students who need extra support.

- Notes and suggestions for teachers to use this toolkit on specific assignments.

- A section devoted to how this writing toolkit aligns to the Common Core State Standards, specifically the English Language Arts Literacy Standards for Writing in History/Social Studies, Science, & Technical Subjects.

Resources Used in Constructing This Toolkit

http://www.germanna.edu/tutor/handouts/chemistry/Lab_Report.pdf
http://www.baylor.edu/content/services/document.php/110769.pdf
Stoughton High School Science Department
O’Donnell Middle School Science Department
Amanda Zullo, Sarnac Lake High School
http://centerx.gseis.ucla.edu/partnerships-grants/tiip/showcase/claremont-project-portfolio
Assignments following this toolkit should meet the following standards from the Common Core State Standards for English Language Arts Literacy for Writing in History/Social Studies, Science, & Technical Subjects (WHST). Other standards may also be met by the assignment.

**Text Types and Purposes**

**CCSS.ELA-Literacy.WHST.6-8.1** Write arguments focused on discipline-specific content.
- **CCSS.ELA-Literacy.WHST.6-8.1a** Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
- **CCSS.ELA-Literacy.WHST.6-8.1b** Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
- **CCSS.ELA-Literacy.WHST.6-8.1c** Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
- **CCSS.ELA-Literacy.WHST.6-8.1d** Establish and maintain a formal style.
- **CCSS.ELA-Literacy.WHST.6-8.1e** Provide a concluding statement or section that follows from and supports the argument presented.

**CCSS.ELA-Literacy.WHST.6-8.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- **CCSS.ELA-Literacy.WHST.6-8.2a** Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
- **CCSS.ELA-Literacy.WHST.6-8.2b** Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
- **CCSS.ELA-Literacy.WHST.6-8.2c** Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
- **CCSS.ELA-Literacy.WHST.6-8.2d** Use precise language and domain-specific vocabulary to inform about or explain the topic.
- **CCSS.ELA-Literacy.WHST.6-8.2e** Establish and maintain a formal style and objective tone.
- **CCSS.ELA-Literacy.WHST.6-8.2f** Provide a concluding statement or section that follows from and supports the information or explanation presented.

**Production and Distribution of Writing**

**CCSS.ELA-Literacy.WHST.6-8.4** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

**CCSS.ELA-Literacy.WHST.6-8.5** With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

**Research to Build and Present Knowledge**

**CCSS.ELA-Literacy.WHST.6-8.7** Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

**CCSS.ELA-Literacy.WHST.6-8.9** Draw evidence from informational texts to support analysis reflection, and research.

**Range of Writing**

**CCSS.ELA-Literacy.WHST.6-8.10** Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
One Page Outline of a Lab Report

**Title**
Describe the lab in a phrase.

**Introduction**
In paragraph form, write the purpose or question that guides your experiment, why the topic is important to investigate (including background information), a **hypothesis** about the outcome (as an if...then statement), and a reason for your hypothesis. You may want to list the variables and controls involved in your experiment.

**Safety**
Write the specific steps you took to keep safe during the experiment. Include information about hazardous substances, precautions to take, and safety equipment needed.

**Materials**
List equipment and chemicals used accurately and completely, including the amounts/quantities of each. Use correct names.

**Procedure**
Write step-wise in the form of a numbered list or as a narrative paragraph. Describe the process of the experiment exactly as it was done in the laboratory. Include enough information so that someone else could re-run the experiment. Use diagrams when appropriate. Do not write any data, results, or observations in this section. Focus on the actions, not who is doing it or what they are observing.

**Data and Results**
Organize observations and measurements in tables, charts, and graphs whenever possible. Each figure must include a descriptive caption. All numbers should include proper units. Organize narrative observations (information written using sentences) in a neat and orderly form. Do not explain in this section (i.e. don’t use the word “because.”)

**Conclusion**
In 1-2 sentences, make a claim about the overall pattern or trend in your results. It should answer the lab’s original purpose/question. In paragraph form, explain your conclusion. You may want to answer:

- What do your results mean?
- How does your data support or reject your hypothesis?
- How does information from class relate to your conclusion?
- What sources of error could have affected your results?

Use evidence from your data and results, but only repeat your observations if you use them as examples. Keep in mind that you are writing for people who want to understand why you made your conclusion.

**Tips For a Great Lab Report**
- Label each section with its name.
- Be concise. Avoid repetition.
- Writing the report is easier if you take good notes and are organized during the experiment.
- Avoid using the words “I”, “we”, & “you”.
- Write using your actual results, not the results you think you should have.
- Explain what went wrong and suggest ways the experiment might be improved in the future.

**Formatting Tips**
- Capitalize scientists’ names (Darwin) and brand names (Tide® detergent) because they are proper names. Common names should be lowercase. Species names should be italicized (*Homo sapiens*).
- Use official S.I. unit abbreviations only: L for liters, ml for milliliters, g for grams, s for seconds, m for meters. Use one space between a number and its unit (5.1 ml).
- Format exponents, superscripts, and subscripts appropriately. (Format > Font menu, or type on the keyboard CTRL- = for subscript and CTRL-SHIFT-= for superscript.)
- Use symbols (such as the degree symbol,°, and Greek letters, like α). Copy and paste from a web site, or use the Insert > Symbol menu.
- Cite outside sources according to the format required by your teacher (such as APA format).
- Typed papers: 12 point Times New Roman font (or equivalent), black ink, double-space (unless your instructor specifies otherwise), 1 inch margins.
- Staple all parts of report together. Do not use clip-art or irrelevant pictures.
- Attach any additional sheets required by your teacher.

**Useful Vocabulary**
- **hypothesis** - educated guess about the outcome of the experiment.
- **independent variable** - the factor that you change on purpose.
- **dependent variable** - a factor that you expect to change as a result.
- **control** - an experiment run for comparison, with all factors that remain the same throughout the experiment (the **constants**), but not the factor that changes.
- **trials** - the times the experiment is repeated.
**Title**

The title should describe the experiment. It should be specific, professional, and scientific. Don’t use a generic title like “Density Lab”; instead, you could use something like “Using Calculations to Solve for Density”.

**Example Title**
Title: Using Calculations to Solve for Density

**Introduction**

This section introduces and gives some background on the topic being explored. It should include three main categories: the Problem, Background Information, and the Hypothesis.

**Problem/Purpose/ Objective of the Experiment**
The purpose is expressed clearly in only one or two sentences, including the main method used to accomplish the purpose.

**Background Information**
The background section should include research that needed to do in order to understand the experiment. Students may want to use outside resources such as notes, textbooks, reference books, scientific publications, and other high-quality sources. The background information should be as straightforward, clear, and concise as possible.

**Hypothesis**
A hypothesis is an educated prediction about what is expected to happen in the experiment based on background information. The hypothesis should be able to be written in a format with the words: “If...then...because...” and it should include the independent and dependent variables. Explain the reason that the hypothesis was chosen.

Some useful vocabulary terms include:

- **The independent variable** is a factor in the experiment that is changed on purpose.
- **The dependent variable** is a factor in the experiment that responds to the independent variable.
- **The control** includes all factors that remain the same throughout the experiment (the **constants**), but not the factor that changes (independent variable).
- **Repeated trials** are the number of times an experiment is repeated and is useful in validating data and checking precision.

An example of an introduction is given on the next page. The problem, background information, and hypothesis are labeled.
**Example Introduction**
Making calculations emphasizes analytic measurements, experimental technique, and problem solving in determining measurements. The purpose in this lab was to determine the densities of regular and irregular shaped objects. The density of an object is calculated by dividing the mass of the object by the volume of the object. A triple beam balance was used to find the mass of all the objects in the experiment. To find the volume of the regular shaped objects, you must find the length, width, and height of the object and multiple these measurements to find the objects volume. To find the volume of the irregular shaped objects, you must use a graduated cylinder and measure the water level before and after the object is placed in the cylinder. The difference in these two numbers is the volume of the irregular shaped object. The SI unit for mass in this experiment was grams. The SI unit for volume in this experiment was cm$^3$ for regular shaped objects and mL for irregular shaped objects. The SI unit for density in this experiment was g/cm$^3$ for regular shaped objects and g/mL for irregular shaped objects. I predict that if an object is heavy, then its density should be higher than water’s (it should sink) and if an object is light, then its density should be lower than water’s (its should float). I expect this result because mass is used to calculate density and I have seen many heavy objects sink in water.

**SAFETY**
This section should include information on hazardous substances, specific precautions to take, and safety equipment needed. Listen to safety information and directions presented during class and read any directions given before starting the lab. Ask the teacher if unsure about any safety information. Safety information should be summarized in as few sentences as possible.

**Example Safety Information**
- Wear goggles during this experiment. Goggles should be worn anytime heat, chemicals, or glassware are used.
- Tell the teacher about any accidents right away.

**MATERIALS**
Write a complete and accurate list of equipment and chemicals. Indicate how much of each material will be used in the experiment. Sketches of complex setups may also be included.

**Example Materials List**

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – Triple Beam Balance</td>
<td>1</td>
</tr>
<tr>
<td>1 – Ruler</td>
<td>10</td>
</tr>
<tr>
<td>1 – Calculator</td>
<td>1</td>
</tr>
<tr>
<td>1 – Container of Water</td>
<td>1</td>
</tr>
<tr>
<td>1 – Graduated Cylinder, 100 mL</td>
<td>1</td>
</tr>
<tr>
<td>1 – Beaker, 500 mL</td>
<td>1</td>
</tr>
</tbody>
</table>

10 – Density Specimens
The procedure section includes the process of the experiment exactly as it was done in the laboratory. The procedure is written out step-wise in the form of a numbered list. It should include cleaning equipment, setting up equipment, taking measurements, and even cleaning up. Never use “I”, “we”, “you”, “me”, or other pronouns in a procedure. Focus on what should be done, not who is doing it.

Do not write any data, results, or observations (things that happened when the procedure was being carried out) in this section; only include the procedures carried out in lab. The section should not include doing calculations or writing a conclusion. A good rule of thumb for writing complete but concise experimental procedures is to include enough information so that others who read the report would be able to duplicate the experiment at a later date.

**Example Stepwise Procedure**
1. Clear the workstation. Have one person on the lab team get all of the materials for the workstation.
2. Separate the density specimens into regular shaped and irregular shaped objects.
3. Write down the name of each regular shaped object under object in a data table.
4. Write down the name of each irregular shaped object under object in a data table.
5. Find the mass of all regular shaped objects using the triple beam balance and record the mass in the data table using grams (g) as the SI unit.
6. Find the mass of all irregular shaped objects using the triple beam balance and record the mass in the data table using grams (g) as the SI unit.
7. Find the volume of all regular shaped objects using the ruler and record the volume in the data table using centimeters cubed (cm$^3$) as the SI unit.
8. Find the volume of all the irregular shaped objects using the water and the graduated cylinder and find the difference in water level before and after the object was placed in the graduated cylinder. Record the volume in the data table using milliliters (mL) as the SI unit.
9. Dry and place all density specimens back on the specimen tray.
10. Use the calculator to calculate the density of each regular shape and irregular shape object. Use g/cm$^3$ as the SI unit for all regular shaped objects and g/mL as the SI unit for all irregular shaped objects.
11. Now that the data table is complete, return all lab materials to the main counter and make sure the lab station is as clean as it was when starting the lab.
12. Create a bar graph showing the density specimen against the density. Use the graph given in the lab handout.
13. Begin analyzing data. Look to find which objects would float in water and which objects will sink in water.
14. Write any notes that will help in writing the conclusion to this lab.
15. Use this lab handout to help write the formal lab report.
DATA AND RESULTS (ALSO KNOWN AS OBSERVATIONS)

This section should include observations from the experiment. Use tables, charts, and graphs whenever possible. Organize narrative observations (information written using sentences) in a neat and orderly form. Be sure to mention everything important that was seen, heard, smelled, or recorded. Include observations such as color, shape, mass (weight), length, volume, temperature, and smell. Data and results should be labeled clearly and include units. Be sure not to attempt to explain.

Suggestions

- Data consists of every raw, unmodified measurement taken during the experiment (and extra observations and notes).
- Results are a product of manipulating data. Examples are calculations and graphs.
- Graphs should be on graph paper, or done using a graphing program like MS Excel. Include proper features of a graph like titles and labels on axes. Graphs should be an appropriate size.
- Use a descriptive caption for each table, chart, and graph. For example “Weights and Densities of Metal Cylinders”.
- Make measurements using metric units (grams, meters, etc.) when possible.

Example Data and Results

<table>
<thead>
<tr>
<th>Object</th>
<th>Mass (g)</th>
<th>Volume</th>
<th>Density (g/cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rubber stopper (cylinder)</td>
<td>6</td>
<td>5 mL</td>
<td>1.2 g/mL</td>
</tr>
<tr>
<td>Food coloring container</td>
<td>8</td>
<td>9 mL</td>
<td>0.9 g/mL</td>
</tr>
<tr>
<td>Plastic stirring rod</td>
<td>9</td>
<td>9 mL</td>
<td>1 g/mL</td>
</tr>
<tr>
<td>Plastic spoon</td>
<td>9</td>
<td>6 mL</td>
<td>1.5 g/mL</td>
</tr>
<tr>
<td>Wooden cube</td>
<td>10</td>
<td>54 cm³</td>
<td>0.2 g/cm³</td>
</tr>
<tr>
<td>Plastic cube</td>
<td>11</td>
<td>54 cm³</td>
<td>0.2 g/cm³</td>
</tr>
<tr>
<td>Square eraser</td>
<td>13</td>
<td>72 cm³</td>
<td>0.2 g/cm³</td>
</tr>
<tr>
<td>Glass stirring rod</td>
<td>13</td>
<td>8 mL</td>
<td>1.6 g/mL</td>
</tr>
<tr>
<td>Metal cube</td>
<td>14</td>
<td>54 cm³</td>
<td>0.3 g/cm³</td>
</tr>
<tr>
<td>Shoe box</td>
<td>26</td>
<td>144 cm³</td>
<td>0.2 g/cm³</td>
</tr>
</tbody>
</table>

- 1 g/mL or 1g/cm³ is the density of water. The specimens below 1 will float in water and the specimens above 1 will sink in water.
**CONCLUSION**

In 1-2 sentences, make a claim about the overall pattern or trend in the results. It should answer the lab’s original purpose/question.

In paragraph form, explain the claim or claims. Use evidence to show the reader how the data and results support the conclusion and claims. Only repeat your observations if they are used as examples. Do not assume the reader can “connect the dots” himself or herself. Connect the dots for him or her. These are some questions that should be answered:

- What have you found? What patterns are in the data?
- How does your claim relate to your original purpose or question??
- How does your data support or reject your hypothesis
- What do your results mean?
- How does your conclusion relate to the information you learned in class or background information you researched?
- What sources of error could have affected your results? In other words, what could have gone wrong and how would you fix that problem?

An example of a conclusion is given on the next page. The claim, explanation, sources of error, and ideas for future experiments are labeled.
Example Conclusion
In this lab, the densities of several regular and irregular shaped objects were calculated successfully. Based on the results, the original hypothesis was incorrect. Not all heavy objects have densities higher than water’s density (1 g/cm³) and not all light objects have densities lower than water’s.

The density equation was used to turn the objects’ mass and volume into density. Since 1 g/mL or 1g/cm³ is the density of water, the specimens below 1 should float in water and the specimens above 1 should sink in water. If this is true, the hypothesis was incorrect. For example, the metal cube was heavy (14 g) but had a density of 0.3 g/cm³ which is lower than water’s density. It should float in water even though it is heavy. The glass stirring rod was also heavy (13 g), but its density was higher than water’s so it should sink. The same conclusion could be made about the lighter objects. Some light objects, such as the food coloring container and wooden cube have densities lower than water and should float. Other objects, such as the rubber stopper and plastic spoon should sink because of their higher densities. The measurements of volume were very difficult because it was hard to get the object completely in the water. The irregularly shaped objects should have a bigger error in their densities as a result. If the density is close to 1 g/mL, they might float or sink because of the error.

Since the density calculation also includes volume, mass is not the only important measurement in predicting density. I conclude that the volume of the object was just as important as the mass in telling whether an object will float or sink in water. Since both variables (mass and volume) play a role in determining whether an object will float or sink in water, another experiment could show that even a very heavy object (like a metal boat) could float in water if its volume was also big enough.

REFERENCES
If outside sources have been cited, a reference list will be needed. Unless a different a format is specified, APA citations should be used. The APA citation guide is later in this document.

APPENDIX
Students may be asked to attach additional information to the end of lab. If there is a significant amount of extra data or calculations, it may be beneficial to put them into an appendix at the end of the report. Hand-written material, the original lab data sheet, additional charts and graphs, prior research, calculations including work, answers to extra questions, and pre-lab assignments are all possible items to include in the appendix.
CREDIBILITY

If a source is credible, it is trustworthy; the quality of evidence and argument is evident; the author's credentials are available; quality control is evident; it is a known or respected authority; it has organizational support. Use websites ending in .edu or .gov, before sites ending in .org and .com. Don't use wikis or forums because anyone can edit them.

- Is there sufficient evidence presented to make the argument persuasive?
- Are compelling arguments and reasons given?
- Are there enough details for a reasonable conclusion about the information?

ACCURACY

If a source is accurate, it is up-to-date, factual, detailed, exact, comprehensive, and its purpose reflects intentions of completeness and accuracy. It gives the whole truth. Several indicators may mean the source is inaccurate:

- No date on the document
- Assertions that are vague or lacking detail
- Sweeping rather than qualified language (that is, the use of always, never, every, completely rather than usually, seldom, sometimes, tends to, and so forth)
- An old date on information known to change rapidly
- A very one-sided view that does not acknowledge or respond to opposing views

HOW TO GOOGLE IT

Information taken from:
http://www.mhhe.com/sosscience/english/allwrite3/seyler/ssite/seyler/so03/cars.mhtml
Go to tinyurl.com/apastyle or www.BibMe.com for more information or to deal with unique situations.

**Books**

Author's last name, first initial(s). (Publication year). *Book title: Subtitle*. City State of publication: Publishing company.


**Encyclopedia & Dictionary**

Author's last name, first initial(s). (Date). Title of Article. In *Title of Encyclopedia* (Volume, pages). City of publication: Publishing company.


**Magazine & Newspaper Articles**

Author's last name, first initial(s). (Publication date). Article title. *Periodical Title, volume number(issue number if available), inclusive pages.*


**Web site or Web page**

**Online periodical**

Author's last name, first initial(s). (Date of publication). Title of article. *Title of Online Periodical, volume number if available(issue number if available), Retrieved from URL.*


**Section of a Web Document**

Author's last name, first initial(s). (Date of publication). *Title of document*. Retrieved from URL

**In-Text Citations Using APA Format**

Ideas or language taken from another author should always be properly cited. If you use the other author’s actual language, use quote marks and an in-text citation. If you paraphrase or summarize the author’s words or ideas, you do not need to use quote marks, but you still must use an in-text citation.

In APA style, in-text citations are placed within sentences and paragraphs so that it is clear what information is being quoted or paraphrased and whose information is being cited. Every work listed as in-text citation should also be listed on the works cited page.

**Works by a single author**
The last name of the author and the year of publication are inserted in the text at the appropriate point.

from theory on bounded rationality (Simon, 1945)

If the name of the author or the date appear in the narrative, cite only missing info. in parentheses.

According to Jones (1998), "Students often had difficulty using APA style, especially when it was their first time" (p. 199).

**Works by multiple authors**
When a work has two authors, always cite both names every time the reference occurs in the text. In parentheses, join the names with an ampersand (&). In a narrative, join the names with the word "and."

as has been shown (Leiter & Maslach, 1998) as Leiter and Maslach (1998) demonstrated

When a work has three, four, or five authors, cite all authors the first time the reference occurs.

Kahneman, Knetsch, and Thaler (1991) found

In all subsequent citations per paragraph, include only the surname of the first author followed by "et al." and the year of publication.

Kahneman et al. (1991) found

**Works by associations, corporations, government agencies, etc.**
The names of groups that serve as authors (corporate authors) are usually written out each time they appear in a text reference.

(National Institute of Mental Health [NIMH], 2007)

When appropriate, the names of some corporate authors are spelled out in the first reference and abbreviated in all subsequent citations.

**Works with no author**
When a work has no author, use the first two or three words of the work's title (omitting any initial articles) as your text reference, capitalizing each word. Place the title in quotation marks if it refers to an article, book chapter, or Web page. Italicize the title if it refers to a book, periodical, brochure, or report.

on climate change ("Climate and Weather," 1997)

How to Insert a Graph or Chart Using Microsoft Word (2003+)

1. Open Microsoft Word. Click on the “Insert” tab and select “Chart” in the illustrations group.

2. Select the type of chart or graph (bar, line, pie), choose the chart/graph style and click “OK.”

3. Microsoft Excel, the Office suite spreadsheet program will then open.

4. Sample data will appear in the Excel grid. Replace the sample data will the data from your experiment. This will be the data portrayed in the chart/graph.

5. Close the Excel spreadsheet.

6. You may now click on the “Design”, “Layout”, and “Format” tab under the Chart Tools in word document to edit the design of the chart/graph that you just created.

7. Your new chart/graph is now complete. You can finish the rest of your word document. Make sure to save it and close it when you are finished.

How to Insert a Table Using Microsoft Word (2003+)

1. Click where you want to create a table.

2. Click “Insert” tab and select “Table” button on the toolbar.

3. Drag to select the number of rows and columns you want for your table.

4. Your table will now appear in your word document.

5. You are now able to add your data to the table and adjust the font size, style (bold), and size of your table.
<table>
<thead>
<tr>
<th>Title</th>
<th>Data and Results/Calculations</th>
</tr>
</thead>
<tbody>
<tr>
<td>_____ A descriptive title of lab is provided</td>
<td>_____ Contains all data, including observations and measurements</td>
</tr>
<tr>
<td><strong>Introduction/Hypothesis</strong></td>
<td>_____ All data and results are labeled</td>
</tr>
<tr>
<td>_____ A purpose or question for the lab is stated</td>
<td>_____ All numbers have proper units</td>
</tr>
<tr>
<td>_____ Background information is provided</td>
<td>_____ Data and results are represented in tables, charts, and graphs</td>
</tr>
<tr>
<td>_____ Specific and precise vocabulary used</td>
<td>_____ Proper features of a graph used (title, labeled axes, type of graph, scale)</td>
</tr>
<tr>
<td>_____ Hypothesis is written in an if...then... format</td>
<td>_____ Work shown for calculations (if present)</td>
</tr>
<tr>
<td>_____ A reason is given for the hypothesis</td>
<td><strong>Safety/Materials/Procedure</strong></td>
</tr>
<tr>
<td>_____ Variables are included</td>
<td><strong>Conclusion</strong></td>
</tr>
<tr>
<td><strong>Safety/Materials/Procedure</strong></td>
<td>_____ Summarizes data used to draw conclusion</td>
</tr>
<tr>
<td>_____ All relevant safety issues described</td>
<td>_____ Conclusion comes from data</td>
</tr>
<tr>
<td>_____ All materials used are listed</td>
<td>_____ Evidence is listed to support the conclusion</td>
</tr>
<tr>
<td>_____ Procedure is well-organized and occurs in a step-by-step sequence</td>
<td>_____ Reasons are given to accept or reject the hypothesis</td>
</tr>
<tr>
<td>_____ Enough information is given so another person of the same ability could repeat the procedure</td>
<td>_____ Possible reasons for errors are given</td>
</tr>
<tr>
<td><strong>Data and Results/Calculations</strong></td>
<td>_____ Suggestions for improvement of this experiment and/or future experiments are given</td>
</tr>
<tr>
<td><strong>Conclusion</strong></td>
<td><strong>Writing</strong></td>
</tr>
<tr>
<td>_____ Summarizes data used to draw conclusion</td>
<td>_____ Format, style, and mechanics and usage considered</td>
</tr>
<tr>
<td>_____ Conclusion comes from data</td>
<td>_____ Evidence is listed to support the conclusion</td>
</tr>
<tr>
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<td>_____ Reasons are given to accept or reject the hypothesis</td>
</tr>
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<td>_____ Suggestions for improvement of this experiment and/or future experiments are given</td>
</tr>
</tbody>
</table>

**Writing**

_____ Format, style, and mechanics and usage considered
<table>
<thead>
<tr>
<th>Title/Introduction/hypothesis</th>
<th>Data &amp; Results / Calculations</th>
<th>Conclusion / Discussion / Sources of Error</th>
<th>Format</th>
<th>Style</th>
<th>Mechanics &amp; Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advanced/Exemplary</strong></td>
<td>Fully explores all relevant safety considerations. Effectively describes, in detail, how the experiment was performed. Includes all materials used and the procedure followed. Written in a manner that allows the experiment to be repeated. (Optional) Designs a detailed procedure that effectively addresses the question being studied. Generates data relevant to the variable(s) being studied and provides for adequate controls.</td>
<td>Claims a precise and well-supported conclusion that responds to the purpose of the lab. Distinguishes the claim from an alternative or opposing claim. Supports claim with logical reasoning and many examples of relevant, accurate data and evidence that demonstrate an understanding of the topic. Fully summarizes and explains the meaning of data and results, with some examples. Explains relationship to hypothesis. Identifies important sources of error and explains effects on results.</td>
<td>Meets all requirements given by your instructor.</td>
<td>The assignment shows advanced use of language and vocabulary, appropriate varied transitions, an objective tone, and a formal style.</td>
<td>The assignment shows exemplary control over grammar, usage and mechanics.</td>
</tr>
<tr>
<td><strong>Proficient</strong></td>
<td>Explores relevant safety considerations. Adequately describes how the experiment was performed. Includes important materials used and the procedure followed. Mostly written so that the experiment can be repeated. (Optional) Designs a procedure that addresses the question being studied. Generates data mostly relevant to the variable(s) being studied and provides for adequate controls.</td>
<td>Claims a conclusion based on data and results that lies to the purpose of the lab. Distinguishes the claim from an alternative or opposing claim. Supports claim with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic. Adequately summarizes and explains the meaning of the data and results. Hypothesis tied to results. Identifies some important sources of error and an effect of a source of error.</td>
<td>Meets most requirements given by your instructor.</td>
<td>The assignment shows precise use of language and vocabulary, appropriate varied transitions, an objective tone, and a formal style.</td>
<td>The assignment shows control over grammar, usage and mechanics and errors do not interfere with communication.</td>
</tr>
<tr>
<td><strong>Needs Improvement</strong></td>
<td>Explores some relevant safety considerations. Somewhat describes how the experiment was performed. Includes some materials used and a skeletal procedure. Somewhat written so that the experiment to be repeated. (Optional) Designs a procedure that barely addresses the question being studied. Lacks ability to collect important data. Variable are not clear and/or lacks adequate controls.</td>
<td>Makes claims and reaches conclusions minimally based on data and results. Somewhat supports claim with logical reasoning and relevant, accurate data and evidence that somewhat demonstrate an understanding of the topic. Somewhat summarizes and explains the meaning of the data and results. Hypothesis tied to results. Inappropriately or minimally identifies sources of error.</td>
<td>Meets some requirements given by your instructor.</td>
<td>The assignment shows simplistic use of language and vocabulary and few appropriate varied transitions. Little or inconsistent attention is given to tone or style.</td>
<td>The assignment shows limited control over grammar, usage and mechanics and errors interfere with communication.</td>
</tr>
<tr>
<td><strong>Failing</strong></td>
<td>Explores irrelevant safety considerations or safety missing. Does not adequately describe how the experiment was performed. Lacks most materials. Experiment cannot be repeated. (Optional) Procedure design is completely inadequate to study question. Lacks variables and data collection methods.</td>
<td>Report is missing large amounts of data and is very unorganized. Tables, charts, and graphs do not show data and results. Calculations not shown.</td>
<td>Does not meet requirements given by instructor.</td>
<td>The assignment shows limited use of language and vocabulary, inappropriate or no transitions. Tone and style are inappropriate.</td>
<td>The assignment fails to follow rules of grammar, usage and mechanics, and errors seriously interfere with communication.</td>
</tr>
</tbody>
</table>

**Title is informative and clear.** Introduces the topic clearly, previewing what is to follow. Clearly explains the purpose of the lab. Includes background information, vocabulary, question(s) or problem(s) to study, and a hypothesis with a full explanation. (Variables fully and clearly identified.) Provides a link between the background information and hypothesis.

**Calculations:**
- Most calculations shown, with units.
- Some calculations shown, with some units.
- Few calculations shown, with few units.
- No calculations shown.

**Safety / Materials / Procedure:**
- Fully explores all relevant safety considerations.
- Effectively describes, in detail, how the experiment was performed. Includes all materials used and the procedure followed. Written in a manner that allows the experiment to be repeated. (Optional) Designs a detailed procedure that effectively addresses the question being studied. Generates data relevant to the variable(s) being studied and provides for adequate controls.

**Data & Results / Calculations:**
- Fully, clearly, and effectively organizes and reports all data collected during the experiment, including all raw data (without interpretation). All data and results organized in clear and fully labeled tables, charts, and graphs. All calculations shown, with units.

**Conclusion / Discussion / Sources of Error:**
- Claims a conclusion based on data and results that lies to the purpose of the lab. Distinguishes the claim from an alternative or opposing claim. Supports claim with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic. Fully summarizes and explains the meaning of data and results, with some examples. Explains relationship to hypothesis. Identifies important sources of error and explains effects on results.

**Format:**
- Meets all requirements given by your instructor.
- Meets most requirements given by your instructor.
- Meets some requirements given by your instructor.
- Does not meet requirements given by instructor.

**Style:**
- The assignment shows advanced use of language and vocabulary, appropriate varied transitions, an objective tone, and a formal style.
- The assignment shows precise use of language and vocabulary, appropriate varied transitions, an objective tone, and a formal style.
- The assignment shows simplistic use of language and vocabulary and few appropriate varied transitions. Little or inconsistent attention is given to tone or style.
- The assignment shows limited use of language and vocabulary, inappropriate or no transitions. Tone and style are inappropriate.

**Mechanics & Usage:**
- The assignment shows exemplary control over grammar, usage and mechanics.
- The assignment shows control over grammar, usage and mechanics and errors do not interfere with communication.
- The assignment shows limited control over grammar, usage, and mechanics and errors interfere with communication.

**Score:**
- Advanced/Exemplary
- Proficient
- Needs Improvement
- Failing

**Note:** Educators may edit this document to fit their students’ needs and to reflect the objectives of their subject-specific assignment. Last Updated 8/5/2013
Name: ______________________________________________

**Testable Question**: What do you want to find out?

____________________________________________________________________

____________________________________________________________________

**Hypothesis**: What do you think will happen?

____________________________________________________________________

____________________________________________________________________

**Independent Variable**: What will you deliberately change?

____________________________________________________________________

____________________________________________________________________

**Control**: What will stay the same so your tests are fair?

____________________________________________________________________

____________________________________________________________________

**Safety**: What specific safety guidelines are necessary?

____________________________________________________________________

____________________________________________________________________

**Dependent Variable**: What will change as a result?

____________________________________________________________________

____________________________________________________________________

**Procedure**: Write the steps for your experiment in the space below. Diagram your apparatus or experimental setup. **Underline names of materials.**

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________
Data and Results: Sketch a table, chart, and/or graph to record your data.

Sources of Error: What were possible sources of error? How would they have affected your data?

Conclusion: What did you find out? Did you results support your hypothesis? Why?
What is a reasonable scientific reason for the trends? Are your results reliable?
What are your thoughts about the experiment? What were your experimental errors?
Are there any new questions generated by the data? How would the experiment be improved?
### Variables & Hypothesis Worksheet

**Science Experiment:**

<table>
<thead>
<tr>
<th>Variables</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Independent Variable</strong></td>
<td>What will you be changing in the experiment?</td>
</tr>
<tr>
<td><strong>Dependent Variable</strong></td>
<td>What will you be measuring or observing?</td>
</tr>
<tr>
<td><strong>Controlled Variables</strong></td>
<td>What will you be keeping the same during the experiment?</td>
</tr>
</tbody>
</table>

**Hypothesis**

Fill in the blanks with the appropriate information from your experiment.

**If [I do this]**

**then [this]**

**will happen**

**because**
RECOGNIZING AND WRITING STRONG HYPOTHESES

1.) A hypothesis is an ______________ guess about what will happen in your experiment.
   • Your hypothesis is based on prior ____________________________________________.
   • You must be able to explain the ________________ for your hypothesis.

   Every hypothesis should follow this format:

   If ________________________, then ________________ because __________________
   (a quick summary of what you are testing)  (what you think will happen)  (why you think this)
   (If I do this…)  (... then I think this will happen…)  (...because of this reason…)

   Example: If I burn a candle under a large beaker and under a small beaker, then the
   candle will burn longer under the large beaker because there is more oxygen
   in the larger beaker.

2.) Write STRONG next to the statement if it is a strong hypothesis and WEAK next to the
   statement if it is a weak hypothesis.

   __________ Mountain Dew will make a plant grow higher than water, milk, or PowerAde.
   __________ Plants given water will grow.
   __________ If people drink soda, then their teeth will decay more quickly than if they
               drink water because soda contains sugar and acid.
   __________ I think that cows that are given vitamins will produce more milk than cows
               that are not given vitamins because they will receive more nutrients.
   __________ I think cows given vitamins will produce milk.
   __________ If students eat breakfast in the morning, then they will do better in school
               than students who do not eat breakfast because they will have more energy.
3.) Write a **strong** hypothesis for each of the following sample experiments. Make sure each hypothesis correctly uses the words “if”, “then”, and “because”.

a.) Will plants that are given fertilizer grow better than plants that are not?

b.) Will students who eat Cheerios do better in school than students who eat Lucky Charms?

c.) Will honey or vinegar attract a greater number of bees?
IDENTIFYING VARIABLES WORKSHEET

Directions: For the following experiments identify the three variables for each experiment: the Independent Variable, the Dependent Variable and the Control Variable.

1. Different rose bushes are grown in a greenhouse for two months. The number of flowers on each bush is counted at the end of the experiment.
   a. Independent Variable ___________________________ _________________________
   b. Dependent Variable _____________________________ _______________________
   c. Control Variable(s) ____________________________ ________________________

2. You water three sunflower plants with salt water. Each plant receives a different concentration of salt solutions. A fourth plant receives pure water. After a two-week period, the height is measured.
   a. Independent Variable ____________________________________________________
   b. Dependent Variable _____________________________ _________________________
   c. Control Variable(s) ____________________________ ________________________

3. Three redwood trees are kept at different humidity levels inside a greenhouse for 12 weeks. One tree is left outside in normal conditions. Height of the tree is measured once a week.
   a. Independent Variable ___________________________ _________________________
   b. Dependent Variable _____________________________ _______________________
   c. Control Variable(s) ____________________________ ________________________

4. Pea plant clones are giving different amounts of water for a three-week period. Pea plant receives 400 milliliters a day. The second pea plant receives 200 milliliters a day. The third pea plant receives 100 milliliters a day. The fourth pea plant does not receive any extra water; the plant only receives natural ways of receiving water. The height of pea plants is recorded daily.
   a. Independent Variable ______________________________________________________
   b. Dependent Variable ______________________________________________________
   c. Control Variable(s) ______________________________________________________
5. One tank of gold fish is fed the normal amount of food once a day, a second tank is fed twice a day, and a third tank four times a day during a six week study. The fish’s weight is recorded daily.
   a. Independent Variable ____________________________________________________
   b. Dependent Variable ___________________________________________________
   c. Control Variable(s) ____________________________________________________

6. You decide to clean the bathroom. You notice that the shower is covered in a strange green slime. You decide to try to get rid of this slime by adding lemonade juice. You spray half of the shower with lemonade juice and spray the other half of the shower with water. After 3 days of spraying equal amounts 3 times a day, there is no change in the appearance of the green slime on either side of the shower.
   a. Independent Variable ____________________________________________________
   b. Dependent Variable ___________________________________________________
   c. Control Variable(s) ____________________________________________________

7. You decide to clean your bedroom. You notice that your floor is covered with clothes. You decide to try to get rid of the clothes by throwing the clothes into the air. You throw clothes from a 1/3 of the room into the closet and a second 1/3 of the room straight up in the air. The last 1/3 of the room you leave the clothes on the floor. After 30 minutes of "cleaning", the floor of the room is now visible.
   a. Independent Variable ____________________________________________________
   b. Dependent Variable ___________________________________________________
   c. Control Variable(s) ____________________________________________________

8. You want to test which size of soccer (football) ball is easiest to juggle with your feet. You test a size 3, size 4 and a size 5 ball. You count the seconds the ball stays in the air for each of the trials. You allow yourself to use both of your feet, knees, and head to juggle the ball.
   a. Independent Variable ____________________________________________________
   b. Dependent Variable ___________________________________________________
   c. Control Variable(s) ____________________________________________________
SpongeBob and his Bikini Bottom pals have been busy doing a little research. Read the description for each experiment and answer the questions.

1. Patty Power
   Mr. Krabbs wants to make Bikini Bottoms a nicer place to live. He has created a new sauce that he thinks will reduce the production of body gas associated with eating crabby patties from the Krusty Krab. He recruits 100 customers with a history of gas problems. He has 50 of them (Group A) eat crabby patties with the new sauce. The other 50 (Group B) eat crabby patties with sauce that looks just like new sauce but is really just mixture of mayonnaise and food coloring. Both groups were told that they were getting the sauce that would reduce gas production. Two hours after eating the crabby patties, 30 customers in group A reported having fewer gas problems and 8 customers in group B reported having fewer gas problems. Which people are in the control group?
   a.) What is the independent variable?
   b.) What is the dependent variable?
   c.) What should Mr. Krabs’ conclusion be?
   d.) Why do you think 8 people in group B reported feeling better?

2. Slimotosis
   Sponge Bob notices that his pal Gary is suffering from slimotosis, which occurs when the shell develops a nasty slime and gives off a horrible odor. His friend Patrick tells him that rubbing seaweed on the shell is the perfect cure, while Sandy says that drinking Dr. Kelp will be a better cure. Sponge Bob decides to test this cure by rubbing Gary with seaweed for 1 week and having him drink Dr. Kelp. After a week of treatment, the slime is gone and Gary’s shell smells better.
   a.) What was the initial observation?
   b.) What is the independent variable?
   c.) What is the dependent variable?
   d.) What should Sponge Bob’s conclusion be?
3. Marshmallow Muscles

Larry was told that a certain muscle cream was the newest best thing on the market and claims to double a person’s muscle power when used as part of a muscle-building workout. Interested in this product, he buys the special muscle cream and recruits Patrick and SpongeBob to help him with an experiment. Larry develops a special marshmallow weight-lifting program for Patrick and SpongeBob. He meets with them once every day for a period of 2 weeks and keeps track of their results. Before each session Patrick’s arms and back are lathered in the muscle cream, while Sponge Bob’s arms and back are lathered with the regular lotion.

<table>
<thead>
<tr>
<th>Time</th>
<th>Patrick</th>
<th>SpongeBob</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Amount</td>
<td>18</td>
<td>5</td>
</tr>
<tr>
<td>After 1 week</td>
<td>24</td>
<td>9</td>
</tr>
<tr>
<td>After 2 weeks</td>
<td>33</td>
<td>17</td>
</tr>
</tbody>
</table>

a.) Which person is in the control group?

b.) What is the independent variable?

c.) What is the dependent variable?

d.) What should Larry’s conclusion be?

4 – Microwave Miracle

Patrick believes that fish that eat food exposed to microwaves will become smarter and would be able to swim through a maze faster. He decides to perform an experiment by placing fish food in a microwave for 20 seconds. He has the fish swim through a maze and records the time it takes for each one to make it to the end. He feeds the special food to 10 fish and gives regular food to 10 others. After 1 week, he has the fish swim through the maze again and records the times for each.

<table>
<thead>
<tr>
<th>Fish</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1:06</td>
<td>1:00</td>
</tr>
<tr>
<td>2</td>
<td>1:54</td>
<td>1:20</td>
</tr>
<tr>
<td>3</td>
<td>2:04</td>
<td>1:57</td>
</tr>
<tr>
<td>4</td>
<td>2:15</td>
<td>2:20</td>
</tr>
<tr>
<td>5</td>
<td>2:27</td>
<td>2:20</td>
</tr>
<tr>
<td>6</td>
<td>1:45</td>
<td>1:40</td>
</tr>
<tr>
<td>7</td>
<td>1:01</td>
<td>1:15</td>
</tr>
<tr>
<td>8</td>
<td>1:28</td>
<td>1:26</td>
</tr>
<tr>
<td>9</td>
<td>1:09</td>
<td>1:00</td>
</tr>
<tr>
<td>10</td>
<td>2:00</td>
<td>1:43</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fish</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1:09</td>
<td>1:08</td>
</tr>
<tr>
<td>2</td>
<td>1:45</td>
<td>1:30</td>
</tr>
<tr>
<td>3</td>
<td>2:00</td>
<td>2:05</td>
</tr>
<tr>
<td>4</td>
<td>1:30</td>
<td>1:23</td>
</tr>
<tr>
<td>5</td>
<td>1:28</td>
<td>1:24</td>
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<tr>
<td>6</td>
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<td>1:15</td>
</tr>
<tr>
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<td>1:57</td>
</tr>
<tr>
<td>10</td>
<td>1:34</td>
<td>1:30</td>
</tr>
</tbody>
</table>

a.) What was Patrick’s hypothesis?

b.) Which fish are in the control group?

c.) What is the independent variable?

d.) What is the dependent variable?

e.) Look at the results in the charts. What should Patrick’s conclusion be?
DEVELOPING A HYPOTHESIS

Taken from Prentice Hall Inquiry Skills Activity Book

Suppose you and your neighbor are growing tomatoes. One day you notice that your neighbor’s plants are much bigger than yours. What’s causing the difference? How can you get your plants to grow as big as your neighbor’s?

The question you asked about the tomato plants could lead you to develop a hypothesis. A hypothesis (plural: hypotheses) is a prediction about the outcome of a scientific investigation. Like all predictions, hypotheses are based on a person’s observations and previous knowledge or experience.

In science, hypotheses must be testable. That means that researchers should be able to carry out an investigation and obtain evidence that shows whether the hypothesis is true or false. The way a hypothesis is written can outline a way to test it. Try to word each of your hypotheses in the form of an If . . . then . . . statement.

Read the following three examples. Notice which of these predictions are testable. Notice which are properly worded hypotheses.

Example 1: If I give my plants fertilizer, then they will grow as big as my neighbor’s plants. (testable and properly worded)

Example 2: If I get lucky, then my plants will grow bigger. (not testable, because you can’t control "getting lucky")

Example 3: My plants aren’t growing bigger because I don’t water them enough. (not worded properly)

Tips for Developing Hypotheses

◆ Ideas for hypotheses often result from problems that have been identified or questions that have been raised. To help develop ideas for a hypothesis, write down several questions about the topic. Try to narrow the questions to one that can be investigated scientifically. Then write the hypothesis.

◆ Make sure the hypothesis is a prediction.

◆ Make sure the hypothesis can be tested through an investigation.

◆ Check the way you worded the hypothesis. A properly worded hypothesis should take the form of an If . . . then . . . statement.

Checkpoint: Write a properly worded hypothesis based on this question: “Will empty trucks use the same amount of gas as heavily loaded trucks?”
Developing a Hypothesis

The day after a picnic, you look into the cooler. All of yesterday’s ice has turned to water. Only two beverages are left. A can of diet soda is floating at the surface. A can of regular soda is resting at the bottom.

You pick up the two cans. You see that both drinks are made by the same company. Then you read the labels.

Regular Soda

Diet Soda
Developing a Hypothesis (continued)

Answer the following questions. Use the back of this sheet if you need more space.

1. You think that something about the regular drink must have made it sink, while something about the diet drink made it float. Write down at least two possible explanations for the events.

2. Suppose that the type of drink did not affect which can floated or sank. Maybe the cans themselves were different in some way. Maybe something besides soda got into one of the cans by mistake. Write down at least two possible explanations for the events.

3. Write down any other possible explanations you can think of. Could the cooler have had any affect? Could something in the water be responsible? Could there be an object in the water that you can’t see?

4. Review your answers to Question 1. Use one of your ideas to write a hypothesis explaining why one can floated and the other sank. (Hint: Make sure you use the words If . . . , then . . . )

5. Review your answers to Questions 2 and 3. Choose one of your statements describing something besides the type of drink that caused the floating or sinking. Write a hypothesis based on that idea.

6. Are both of your hypotheses testable? Write a brief description of how you could test each one. Mention any equipment you would need. (Hint: You can open the cans and pour out the drinks as part of your tests.)

7. Think About It Review your work. Use it to help you write a short summary of how to develop a hypothesis about an event.
**PROBLEM:** What are you testing?

**PROCEDURE:** What are you going to do? (Summarize the procedure)

**What do you think will happen?**

**HYPOTHESIS**

If ____________________________________________________________, then ____________________________________________________________

**DESIGN**

- **Independent Variable**
  (the thing you changed)

- **Dependent Variable**
  (the thing that also changes)

- **Constants**
  (all the things that are the same between each run)

- **Control Run**
  (the baseline that you compare everything to)

- **Experimental Run(s)**
  (the runs or trials that you changed things)

**DATA**

- **Table**

<table>
<thead>
<tr>
<th>X</th>
<th>Y₁</th>
<th>Y₂</th>
</tr>
</thead>
</table>

**Label:**

**Units:**

**Observations**

**Sketch Your Graph**

Does the graph have...

- Descriptive title
- DV on y axis
- IV on x axis
- Units on axes
- A legend

**ANALYSIS:** What does your GRAPHAED DATA tell you about the PROBLEM in this experiment?

(Provide one sentence that connects the results in your graph to what you were trying to find out.)

*Adapted from a document created for the Claremont Unified School District by Cheryl Fierito, Linda Moule, Marizko Rivette, Sarah Woods, and Erik Tucker. Funding provided by the UCLA TIIP Grant (2011-2013).*
# SCIENTIFIC WRITING AND COMMON CORE GRAPHIC ORGANIZER

## INTRODUCTORY PARAGRAPH
- What were you trying to find out?
- What did you do to find it?
- What did you think would happen?

## THESIS STATEMENT
- What is your ONE most important piece of data you collected?
- Why did you do this lab?
- How good are your results?

## BODY

<table>
<thead>
<tr>
<th>Paragraph 1</th>
<th>Paragraph 2</th>
<th>Paragraph 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Provide a statement of the data trend.</td>
<td>List the major concepts or vocabulary from class that are in this lab. Circle the most important item.</td>
</tr>
<tr>
<td>2</td>
<td>What does the data tell us about the problem?</td>
<td>Explain <strong>how the circled term applies to THIS lab.</strong></td>
</tr>
<tr>
<td>3</td>
<td>Was your hypothesis right? Why did you think that would happen?</td>
<td>What standard, key concept, and/or objective does this lab address?</td>
</tr>
</tbody>
</table>

## CONCLUSION
- Restate your thesis in different words.
- What is so important about this lab to our learning?

---

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<table>
<thead>
<tr>
<th>Text Types and Purposes</th>
<th>Grades 6-8</th>
<th>Grades 9-10</th>
<th>Grades 11-12</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CCSS ELA-Literacy.WHST.6-8.1</strong> Write arguments focused on discipline-specific content.</td>
<td><strong>CCSS ELA-Literacy.WHST.6-8.1a</strong> Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.</td>
<td><strong>CCSS ELA-Literacy.WHST.6-8.1b</strong> Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.</td>
<td><strong>CCSS ELA-Literacy.WHST.11-12.1</strong> Write arguments focused on discipline-specific content. <strong>CCSS ELA-Literacy.WHST.11-12.1a</strong> Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. <strong>CCSS ELA-Literacy.WHST.11-12.1b</strong> Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience’s knowledge level and concerns. <strong>CCSS ELA-Literacy.WHST.11-12.1c</strong> Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. <strong>CCSS ELA-Literacy.WHST.11-12.1d</strong> Establish and maintain a formal style. <strong>CCSS ELA-Literacy.WHST.11-12.1e</strong> Provide a concluding statement or section that follows from and supports the argument presented.</td>
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<td><strong>CCSS ELA-Literacy.WHST.6-8.1c</strong> Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.</td>
<td><strong>CCSS ELA-Literacy.WHST.6-8.1d</strong> Establish and maintain a formal style.</td>
<td><strong>CCSS ELA-Literacy.WHST.6-8.1e</strong> Provide a concluding statement or section that follows from and supports the argument presented.</td>
<td><strong>CCSS ELA-Literacy.WHST.11-12.1f</strong> Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. <strong>CCSS ELA-Literacy.WHST.11-12.1g</strong> Provide a concluding statement or section that follows from and supports the argument presented.</td>
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<td><strong>CCSS ELA-Literacy.WHST.6-8.2</strong> Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. <strong>CCSS ELA-Literacy.WHST.6-8.2a</strong> Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.</td>
<td><strong>CCSS ELA-Literacy.WHST.6-8.2b</strong> Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. <strong>CCSS ELA-Literacy.WHST.6-8.2c</strong> Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. <strong>CCSS ELA-Literacy.WHST.6-8.2d</strong> Use precise language and domain-specific vocabulary to inform about or explain the topic.</td>
<td><strong>CCSS ELA-Literacy.WHST.9-10.2</strong> Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. <strong>CCSS ELA-Literacy.WHST.9-10.2a</strong> Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. <strong>CCSS ELA-Literacy.WHST.9-10.2b</strong> Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. <strong>CCSS ELA-Literacy.WHST.9-10.2c</strong> Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. <strong>CCSS ELA-Literacy.WHST.9-10.2d</strong> Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. <strong>CCSS ELA-Literacy.WHST.9-10.2e</strong> Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. <strong>CCSS ELA-Literacy.WHST.9-10.2f</strong> Provide a concluding statement or section that follows from and supports the argument presented.</td>
<td><strong>CCSS ELA-Literacy.WHST.11-12.2</strong> Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. <strong>CCSS ELA-Literacy.WHST.11-12.2a</strong> Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. <strong>CCSS ELA-Literacy.WHST.11-12.2b</strong> Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. <strong>CCSS ELA-Literacy.WHST.11-12.2c</strong> Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. <strong>CCSS ELA-Literacy.WHST.11-12.2d</strong> Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.</td>
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</table>

**CCSS ELA-Literacy.WHST.6-8.2f** Provide a concluding statement or section that follows from and supports the argument presented.
<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
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<tr>
<td>CCSS.ELA-Literacy.WHST.6-8.2e</td>
<td>Establish and maintain a formal style and objective tone.</td>
<td>CCSS.ELA-Literacy.WHST.9-10.2f</td>
<td>Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).</td>
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<td>(See note; not applicable as a separate requirement)</td>
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<td>Production and Distribution of Writing</td>
<td></td>
<td>CCSS.ELA-Literacy.WHST.6-8.4</td>
<td>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</td>
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<td>CCSS.ELA-Literacy.WHST.6-8.5</td>
<td>With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.</td>
<td>CCSS.ELA-Literacy.WHST.9-10.5</td>
<td>Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.</td>
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<td></td>
<td>CCSS.ELA-Literacy.WHST.6-8.6</td>
<td>Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.</td>
<td>CCSS.ELA-Literacy.WHST.9-10.6</td>
<td>Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology’s capacity to link to other information and to display information flexibly and dynamically.</td>
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<tr>
<td>Research to Build and Present Knowledge</td>
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<td>CCSS.ELA-Literacy.WHST.6-8.7</td>
<td>Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.</td>
<td>CCSS.ELA-Literacy.WHST.9-10.7</td>
<td>Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.</td>
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<td>CCSS.ELA-Literacy.WHST.6-8.8</td>
<td>Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.</td>
<td>CCSS.ELA-Literacy.WHST.9-10.8</td>
<td>Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.</td>
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<td>CCSS.ELA-Literacy.WHST.6-8.9</td>
<td>Draw evidence from informational texts to support analysis reflection, and research.</td>
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<td>Range of Writing</td>
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<td>CCSS.ELA-Literacy.WHST.6-8.10</td>
<td>Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.</td>
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Highlighted words are different from the previous grade level standards (or unique to Grades 6-8).

Students’ narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In science and technical subjects, students must be able to write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results.