

BI 103 Lab Writing Assignment 2

Design your own experiment!

This assignment requires you to evaluate a hypothesis and communicate the results of the lab experiment you designed. The questions and information below are meant to guide you to reporting the key findings of your experiment and help you think through how to explain the findings and draw conclusions from them in a scientific manner. Because you've already practiced these skills once, this assignment is worth 16 points.

ASSIGNMENT: Please respond to the following questions to complete your laboratory write up.. Make sure that your write up is accurate, and clearly written so that it is easily readable.

A grading rubric is provided on the second page of this assignment. To earn full points on your write up, you must provide answers that align to the “meets” column of your grading rubric as well as meeting all “Quality of Writing and Mechanics” elements described in the rubric. There are also some tips on pages 4-5 of this assignment to help you succeed.

FORMAT:

- Type your responses, using 1.5 or double spacing.
- Include the section headings (Hypothesis, Results, Analysis) and question number (example: 1, 2, 3, etc) in your answers but do *not* rewrite the question.
- Graphs may be made with a computer program (example: Microsoft excel, Mac numbers, etc) or may be neatly produced with a ruler on graphing paper.
- Print out the cover sheet on page 2 of this assignment, read and sign the academic honesty statement, and submit it with your write up. Your instructor **WILL NOT** accept a write up without the signed cover sheet.

DUE DATE: Your write up is due at the beginning of class next week. Late assignments will have 1 point deducted per day up to 5 days, at which point the assignment will be assigned 0 points.

Hypothesis and Prediction – Part 1 of Rubric

1. What did you think was going to happen in this experiment and why? You may find it helpful to state your answers to these questions as an “if-then” hypothesis-prediction. Be sure you have included a biological rationale that explains WHY you made this hypothesis/prediction based on concepts that we have gone over in Biology 103.

Methods: Part 2 of Rubric

2. How did you conduct your experiment? Include a paragraph that describes your experimental setup and data collection. This section should include enough detail that another person would be able to replicate your experiment. Note that the methods should be written in full sentences, and not a bulleted or numbered list of steps!

Results – Part 3 of Rubric

3. What results did you get from your experiment? Answer this question by creating a data table and graph that show the results of your simulation experiment. If you need assistance building a graph, there is a Guide to Graphing resource available on your Moodle lab course site. Below are some hints:
 - Your data table should have clear headings that include all applicable units
 - Your data table should be computer generated, not hand drawn.
 - Make sure that you are making the appropriate graph type for your data!

Analysis- Part 4 of Rubric

4. Explain why you think that the results shown in your graph support or refute your hypothesis (remember we never “prove” anything in science). Consider all your data and the overall data pattern as you answer this question. Don't ignore unusual data that may not seem to fit into a specific patterns (“outliers”). Explain what you think might be behind these unusual data points. Also include any interesting observations you made during your experiment.
5. What is the biological significance of your results? What biological concepts explain why you obtained the results that you did? This section will vary based on your experiment, but you should be using concepts from 103 material to explain your results!

References- Mechanics Checklist

6. Provide at least one full citation (make sure you include an in-text citation that pinpoints where you used this resource) for a resource you made use of in performing the experiment, understanding the concepts and writing this assignment. (Perhaps your lab manual? Your textbook? A website?) If you used more than one resource, you need to cite each one! If you need help with citations, a Guide to Citing References is available on your Moodle lab course site.

Element	Misses: 1	Approaches: 2	Meets: 3
Hypothesis : <i>Clarity/Specificity</i> <i>Testability</i> <i>Rationale</i>	___Hypothesis is unclear and hard-to-understand or does not address the experimental question. ___Hypothesis is not testable ___No rationale for hypothesis or rationale is fully inaccurate	___Hypothesis included is clearly stated, but not specific or lacks specific details ___Hypothesis is testable, but not in a feasible way ___Some foundation for hypothesis, but based in part on inaccuracy	___Hypothesis included is clearly stated, very specific, and addresses the experimental question. ___Hypothesis is testable and could be tested within lab parameters ___Rationale for hypothesis is grounded in accurate information
Methods <i>Clarity</i>	___Not all procedures are included, are not clear and lack many details	___Most procedures are described, but not clearly and details lacking	___All procedures are described, with all needed details clearly outlined . Any relevant equipment is mentioned
Graph and Table <i>Data table</i> <i>Elements</i> <i>Variables</i> <i>Graph clarity</i> <i>Data accuracy</i>	___ Results not presented in data table or table is very difficult to interpret ___ Graph lacks a title or labels ___ Variables not addressed in graph ___ Graph is hard to read and comparisons cannot be made: no key; Inappropriate graph type or use of scale ___ Data graphed is inaccurate or does not relate to experiment	___Results presented in table, but is lacking some data or unclear ___Graph has a title that is not very descriptive, labels are unclear or incorrect ___ Variables addressed in graph, but not on correct axes ___ Graph is somewhat readable, comparisons can be made with difficulty: key is hard to understand; Appropriate graph type, but not scaled well ___Data graphed is partially accurate; some data is missing	___Results clearly presented in a data table ___Graph has a concise, descriptive title and appropriately labeled axes with ___ Variables on correct axes ___ Graph is clearly readable and comparisons between treatments are easy to make: key is clear; Graph type and scale are appropriate to data ___Data graphed is accurate and includes all relevant data, including controls (if needed)
Analysis <i>Hypothesis</i> <i>Scientific language</i> <i>Data addressed</i> <i>Explanation</i>	___Hypothesis is not addressed ___Hypothesis is described using language like proven, true, or right ___No explanations for data trends in table or graph, no mention of outliers ___No explanation for data trends or explanations are completely inaccurate	___Hypothesis is evaluated, but does not discuss specific data ___Hypothesis is not consistently described as supported or refuted ___Some data considered in conclusions but other data is ignored. Any unusual "outliers" are ignored ___Explanations include minimal or some inaccurate concepts	___Hypothesis is evaluated based upon data. ___Hypothesis is consistently described as supported or refuted ___All data collected is considered and addressed by conclusions, including presence of outliers. ___Explanations include relevant and accurate concepts
Presentation	___ Did not participate in group presentation ___ Did not participate in group presentation prep ___ Disruptive audience member during group presentations	___ Small contribution to group presentation. ___ Participated some in group presentation prep ___ Somewhat attentive audience member during group presentations	___ Active participant in group presentation ___ Active participant in group presentation prep ___ Attentive audience member during group presentation

Quality of Writing and Mechanics: Worth 1 point. Write-up should meet all of the following criteria!

- | | | |
|--------------------------|--------------------------|--|
| Yes | No | |
| <input type="checkbox"/> | <input type="checkbox"/> | Write up includes your name, the date, and your lab section |
| <input type="checkbox"/> | <input type="checkbox"/> | Write up is free from spelling and grammatical errors (make sure you proofread!!) |
| <input type="checkbox"/> | <input type="checkbox"/> | Write up is clear and easy-to-understand |
| <input type="checkbox"/> | <input type="checkbox"/> | Write up includes full citation for at least one reference with corresponding in-text citation |
| <input type="checkbox"/> | <input type="checkbox"/> | All portions of write up are clearly labeled, and question numbers are included |

PLAGIARISM STATEMENT ON NEXT PAGE!!

Plagiarism refers to the use of original work, ideas, or text that are not your own. This includes cut-and-paste from websites, copying directly from texts, and copying the work of others, including fellow students. Telling someone your answers to the questions (including telling someone how to make their graph, question #2), or asking for the answers to any question, is cheating. (Asking someone how to make the graph for this assignment is NOT the same as asking for help learning excel or some other software). All forms of cheating, including plagiarism and copying of work will result in an immediate zero for the exam, quiz, or assignment. In the case of copying, all parties involved in the unethical behavior will earn zeros. Cheating students will be referred to the Student Conduct Committee for further action. You also have the right to appeal to the Student Conduct Committee.

I have read and understand the plagiarism statement.

Signature

Guidelines for Good Quality Scientific Reports

Hypothesis and Prediction: The hypothesis is a tentative explanation for the phenomenon. Remember that:

- A good hypothesis and prediction is testable (and should be testable under the conditions of our lab environment; For example, if your hypothesis requires shooting a rocket into space, then its not really testable under our laboratory conditions).
- Your explanation can be ruled out through testing, or falsified.
- A good hypothesis and prediction is detailed and specific in what it is testing.
- A good hypothesis provides a rationale or explanation for why you think your prediction is reasonable and this rationale is based on what we know about biology.
- A good prediction is specific and can be tested with a specific experiment.

Examples*:

I think that diet soda will float and regular soda will sink.

{This hypothesis misses the goal. It is not specific as we don't know where the sodas are floating and sinking, and it does not provide any explanation to explain why the hypothesis makes sense}

Because diet soda does not contain sugar and regular soda does, the diet soda will float in a bucket of water, while regular soda will sink.

{This hypothesis approaches the goal. It is more specific about the conditions, and it provides a partial explanation about why the hypothesis makes sense, but the connection between sugar and sinking is unclear}

If diet soda does not contain sugar, then its density (mass/volume) is lower than that of regular soda which does contain sugar, and so diet soda will float in a bucket of water while regular soda sinks.

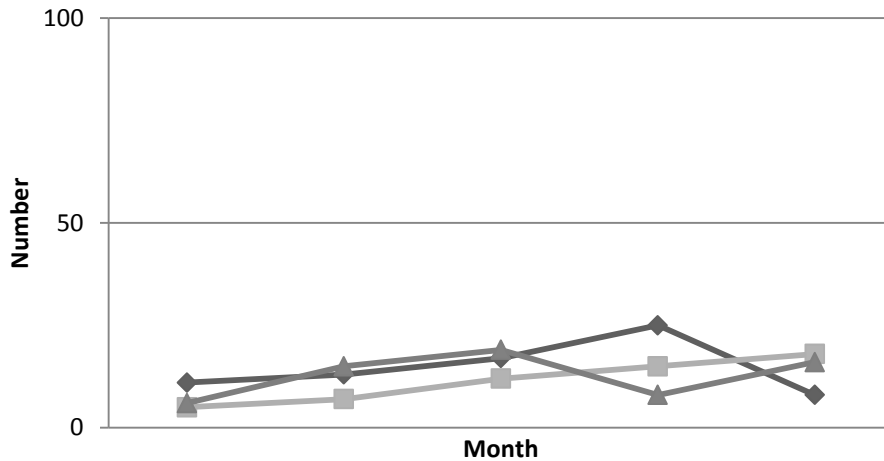
{This hypothesis meets the goal. It is specific and the rationale- sugar affects density and density is what determines floating or sinking in water- is clearly articulated}

*Note that these examples are for different experiments and investigations and NOT about your blood pressure lab. They are provided only to help you think about what you need to include in your write up.

Graph: The graph is a visual representation of the data you gathered while testing your hypothesis. Remember that:

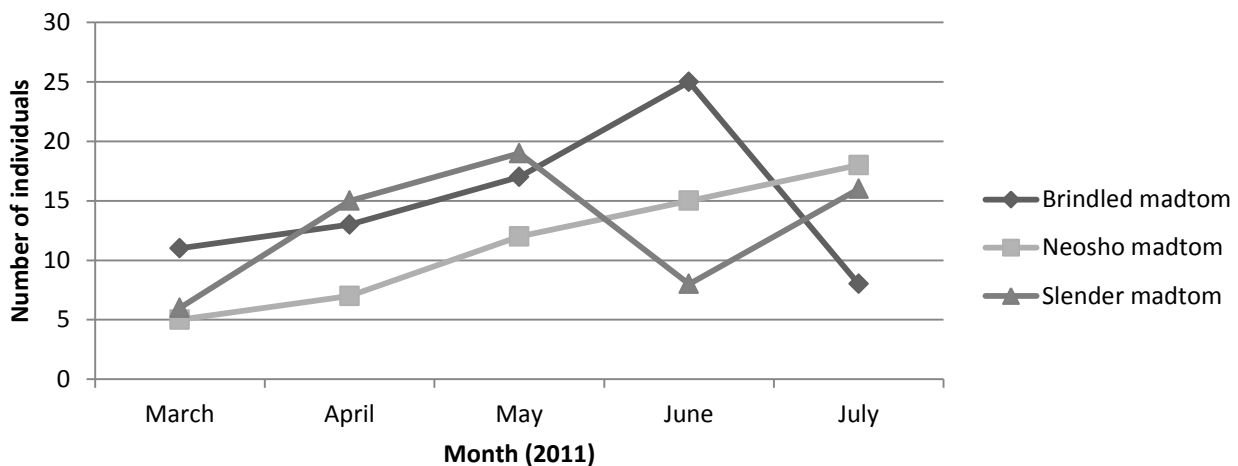
- A graph needs a concise title that clearly describes the data that it is showing.
- Data must be put on the correct axes of the graph. In general, the data you collected (representing what you are trying to find out about) goes on the vertical (Y) axis. The supporting data that that describes how, when or under what conditions you collected your data goes on the horizontal (X) axis. (For this reason time nearly always goes on the X-axis).
- Axes must be labeled, including the units in which data were recorded
- Data points should be clearly marked and identified; a key is helpful if more than one group of data is included in the graph.
- The scale of a graph is important. It should be consistent (there should be no change in the units or increments on a single axis) and appropriate to the data you collected

Examples:



{This graph misses the goal. There is no title, nor is there a key to help distinguish what the data points mean. The scale is too large- from 0 to 100 with an increment of 50, when the maximum number in the graph is 25- and makes it hard to interpret this graph. The x-axis is labeled, but without units (the months) and the y-axis has units, but the label is incomplete- number of what?}

Population size of three different madtom catfish in the Marais de Cygnes River in Spring/Summer 2011



{This graph meets the goal. There is a descriptive title, and all of the axes are clearly labeled with units. There is a key so that we can distinguish what each set of data points represent. The dependent variable (number of individuals) is correctly placed on the y-axis with the independent variable of time placed on the x-axis. The scale of 0-30 is appropriate to the data, with each line on the x-axis representing an increment of 5.}

Analysis: You need to evaluate your hypothesis based on the data patterns shown by your graph. Remember that:

- You use data to determine support or refute your hypothesis. It is only possible to support a hypothesis, not to “prove” one (that would require testing every possible permutation and combination of factors). Your evaluation of your hypothesis should not be contradicted by the pattern shown by your data.
- Refer back to the prediction you made as part of your hypothesis and use your data to justify your decision to support or refute your hypothesis.
- In the “if” part of your hypothesis you should have provided a rationale, or explanation for the prediction you made in your hypothesis (“then” part of hypothesis). Use this to help you explain why you think you observed the specific pattern of data revealed in your graph.
- You should consider all of the data you collected in examining the support (or lack of support for your hypothesis). If there are unusual data points or “outliers” that don’t seem to fit the general pattern in your graph, explain what you think those mean.

Examples:

I was right. Diet Pepsi floated and so did Apricot Nectar. Regular Pepsi sank. Obviously the regular Pepsi was heavier. This helps us understand the concept of density, which is a really important one.

{This analysis misses the goal. The hypothesis isn’t actually mentioned and the data is only briefly described. There is no explanation of the importance of the Apricot Nectar results. Finally, there is no connection to how these results help understand density or why it is biologically important}

I hypothesized that diet soda would float, and all three cans of diet Pepsi did float while the regular Pepsi sank. This supports my hypothesis. Both types of Pepsi were 8.5 fluid ounces in volume, but the regular Pepsi also contained 16 grams of sugar. This means that the regular Pepsi had 16 more grams of mass provided by the sugar in the same amount of volume. This would lead to an increase in density, which explains why the regular soda cans sank. When we put in a can of Apricot Nectar, which had 19 grams of sugar, it floated. This was unexpected, but I think it is explained by the fact that an Apricot Nectar can had a volume of 7 fluid ounces, but the dimensions of the can are the same as that of a Pepsi can. A same-sized can with less liquid probably has an air space that helped it float. The results of this experiment help us understand how the air bladder of a fish, which creates an air space inside the fish, helps it float in the water and also how seaweeds and other living things with air spaces or other factors that decrease their density keep from sinking to the bottom of the water.

{This analysis meets the goal. It clearly ties the hypothesis to the results and outlines what they mean. It describes how the results support the hypothesis, but also explains a possible reason behind the unusual results of the Apricot Nectar. Finally, there is a link to how this experiment helps us understand biology}