**Grading Plan**

*Pre-labs (2 points):*

1 point for submission, 1 point for reasonable demonstrated effort

*Two Week Labs (3 points for participation, 5 points for quality [0, 0.5, 1 for each rubric element]):*

1. After the first week is submitted, grade according to the rubric that is provided to students. Provide brief blurbs of feedback to groups after the first week. May copy and paste directly from the compiled list of suggestions for improvements or write own depending on what will be useful to the group. Feedback should focus on elements that are missing or insufficient as well as improvements that can be made the subsequent week.
2. After the second week is submitted, grade according to the rubric that is provided to students. Provide a few comments of aspects they should think about for the new experiment the following week or other generic process elements that will be useful in the future.

*One Week Labs (3 points for participation, 5 points for quality [0, 0.5, 1 for each rubric element]):*

Grade according to the rubric that is provided to students. Provide a few comments of aspects they should think about for the new experiment the following week or other generic process elements that will be useful in the future. May copy and paste from the compiled list of comments.

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| **General** | | **Proficient (1)** | **Beginning (0.5)** | **Missing (0)** |
| Experimental Process | *What are you doing?* | Detailed descriptions of experimental procedures, data analysis, and decisions are provided throughout the investigation. | There are some descriptions of what was done, but some detail is missing. | No description of the experimental process in the lab notes. |
| *Why are you doing it?* | Justification for all decisions is provided including for choices in experimental procedure, data collection, and data analysis. Most justifications come from evidence such as data. | Justifications for decisions are rarely provided or justifications rarely come from evidence. | No decisions or methods are justified. |
| *What will you do next?* | Follow-up actions are suggested based on experimental results and at least one follow-up is pursued, especially to improve methods or models. | Follow-up actions are suggested but not pursued. | No follow-up is proposed. |

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| **Pendulum for Pros** | | **Proficient (1)** | **Beginning (0.5)** | **Missing (0)** |
| Points of Emphasis | *Experimental uncertainty* | Major physical sources of uncertainty are identified and experimental methods include plans to quantify and minimize their impact. The size of uncertainty is reflected on throughout, especially after attempts to minimize them. | Major physical sources of uncertainty are identified but missing plans to quantify, plans to minimize, or reflections. | There is no discussion of physical sources of uncertainty. |
| *Comparing measurements* | Measurements (values and uncertainties) are compared and appropriately interpreted. A decision about what to do with the information is clearly communicated and follows logically from the comparison. | Measurements (values and uncertainties) are compared. The interpretation or follow-up are inappropriate or missing. | Measurements (values and uncertainties) are not compared. |

**Suggested feedback sentences:**

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| **Pendulum for Pros – Week 1 Feedback** | **Suggested feedback I – Hands off** | **Suggested feedback II – More direct** |
| *Students are performing incorrect calculations of statistics.* | Review the statistics handout at the beginning of lab as a group and check your calculations to clear up any mistakes about (insert statistic). | Your group appears to be running into issues with calculating (insert statistic). Let’s review this together near the beginning of lab! There’s also a handout about the statistics for this course, so it will be helpful to review this as a group. |
| *Students are interpreting or using statistics incorrectly.* | Review the statistics handout at the beginning of lab as a group and check whether you are correctly using and interpreting the statistics. Please ask if you have questions! | Your interpretations of what the statistics are indicating about the period of the pendulum could be improved. Review the statistics handout to check your interpretations. If you have questions about this, please ask me! |
| *Students believe they are done with the investigation after one iteration.* | During lab next week, try to improve your measurements to check whether your results are the same with measurements that have less uncertainty. Then start to explore why! Review the rubric for what I’ll be looking for when grading. |  |
| *Students are not fully documenting their process.* | Review the rubric for next week and ensure that you are clearly documenting all your decisions and justification for those decisions as you continue through the lab. I care more about understanding your process than your outcomes. |  |
| *Students are deleting portions of their lab notes.* | Lab notes are intended to be a thorough record of all decisions your group makes during the lab. Keep everything! If you found that you made a mistake or chose to revise a procedure or analysis, add to your notes why your data or analysis indicated that changes needed to be made. I want to understand your process and how that process lead to conclusions. |  |
| *Students are not getting through the expected portions of the lab.* | Your group either did not record as much as other groups or you did not get through as much data collection and analysis as other groups. At the beginning of lab, chat with other groups about their progress and consider strategies for working more efficiently as a group. |  |
| *Students did an excellent job at recording all their decisions.* | Great job recording all your decisions and justification for those decisions! Keep up this excellent work and check the rubric to ensure you continue to record all decisions! | Fantastic job with paying careful attention to documenting your process with justification for all of your decisions. |
| … | … |  |