Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_

**Formal Lab (30 pts) – Hooke’s Law**

**Due Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Your Task:** With your group, design an experiment that can answer the following questions. Write up your experiment, results, and conclusions in a typed, formal lab report. See the attached rubric for what content should be in your lab report and how it should be structured.

1. What is the relationship between force and displacement of a spring?
2. What are the values of the spring constant (slope of F vs. x graph) for each spring? What does a small spring constant say about the strength of the spring compared to a large spring constant?

**Materials:** You have the following equipment at your disposal.

* Hooke’s Law Spring Apparatus
* Set of slotted masses
* ruler

**Note:** After finding the relationship between force and displacement of your spring, read about Hooke’s Law in the textbook and find the spring constant for your spring. This information should be included in the data analysis section of your report.

**Extra Credit!** Attach this sheet to the BACK of your lab report (so that if I turned your lab report over the rubric would be the first page), and I will give you 1 point of extra credit on your lab report grade.

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| --- | --- | --- | --- | --- | --- |
| **Element** | **1** | **2** | **3** | **4** | **5** |
| Introduction | Missing more than one of the elements in 3, or is overly long and includes irrelevant info. | May be missing one of the elements in 3, or may be wordy or unrelated. | Questions stated, initial observations described, concise, title of lab included. |  |  |
| Hypothesis/  Prediction | No clear delineation between hypothesis and prediction, or hypothesis and prediction are switched, or one is missing. Hypothesis and prediction may or may not relate to the procedure. | Attempt is made at separating hypothesis and prediction from one another. Hypothesis and prediction may or may not relate to the procedure. | Hypothesis and prediction are both stated, though the difference between the two may be unclear. Both hypothesis and prediction are related to the procedure. | Hypothesis and Prediction clearly stated. Prediction is in if-then format and is clearly related to hypothesis. Both hypothesis and prediction make direct reference to methods described in procedure. Concise. |  |
| Materials | Some materials necessary for the procedure are included. | All materials necessary for the procedure are included. |  |  |  |
| Procedure | Procedure requires additional explanation in order to follow, may or may not be numbered. Data obtained from following the procedure may not be useful in answering the questions stated in the introduction. | Procedure is mostly clear, though some steps may require additional explanation. Data obtained from following the procedure can answer the questions stated in the introduction. | Procedure is clear, numbered, and will yield data that can answer the questions stated in the introduction. Someone else could follow the procedure with little help from the author. |  |  |
| Data | Data is not listed in tables, or both units and ± margins of error are missing, and data taken is not enough to answer questions posed in introduction. | Data may or may not be listed in tables with units or ± margins of error. Some data may be missing or there may be extraneous data. Data is difficult to read because of formatting. | Data is listed in tables, includes either units or ± margins of error, and some data is useful for answering questions in introduction. Some data may be missing or there may be extraneous data. | Data is listed in tables, includes either units or ± margins of error, and is useful for answering questions in introduction. | Clearly listed in tables with units, ± margins of error, and is useful data for answering the questions posed in the introduction. |
| Data Analysis | Graphs are messy, or they are missing most of the necessary labels. Independent and dependent variables may or may not be on appropriate axes. Graphs are hard to interpret or are not related to the questions posed in the introduction. No slope calculation, or calculation is incorrect. | Graphs of data are included, may or may not be neat, and are missing three or more elements in 5. Independent and dependent variables may or may not be on appropriate axes. Explanation of graphs included. May not be clear. No slope calculation, or calculation is incorrect. | Graphs of data are included, are mostly neat, and include all but two of the elements listed in 5. Independent and dependent variables are on appropriate axes. Slopes are calculated. | Graphs of data are included, are neat, and include all but one of the elements listed in 5. Independent and dependent variables are on appropriate axes. Slopes are calculated and explained. | Graphs of data are included, are neat, and have title, axis labels, error bars, appropriate scale, line of best fit, and a legend if necessary. Independent and dependent variables are on appropriate axes. Slopes are calculated and explained. |
| Conclusion | Either conclusions do not follow from the data taken, or the questions are not answered, and no mention is made of the hypotheses. | Some questions posed in introduction are answered or discussed, conclusions may or may not be related to the data, and hypotheses may or may not be mentioned. | Most questions posed in introduction are answered, conclusions may or may not be related to the data, and hypotheses are mentioned. | Most questions posed in introduction are answered, conclusions are related to the data and analysis, and the hypotheses are discussed. | All questions posed in introduction are answered, conclusions are directly related to the data and analysis, and correctness of hypotheses is discussed in detail. |
| Experimental Uncertainty | At least 2 uncertainties are listed without suggestions for improvement, or only 1 uncertainties is described as in 3 with improvements. | At least 3 uncertainties are listed, but no improvements are suggested, or only 2 uncertainties are described as in 3 with improvements. | At least 3 uncertainties are listed and discussed. Improvements for reducing those uncertainties are suggested. |  |  |