Report for Experiment #N

Title of the Experiment

Your Name

Lab Partner: Your Partner’s Name

TA: Your Instructor’s Name  
Experiment Date

Abstract

One paragraph with brief description of what was done, which data collected, results of analysis and comparison with theory. Abstract is a compact summary of the Introduction and Conclusion.**Introduction**

(Motivation) Explain why you did this work. What was the goal? Describe how you achieved it with the Investigations you have done. The Introduction is not a rewrite of the experiment introduction in the lab manual. It should include an overview of the physical phenomena studied. Be specific about each part of the Experiment; for each Investigation, state: what was measured, what was calculated and graphed, which data have been obtained, and to which theoretical value the data are compared.

**Investigation 1**

[Be sure your discussion is in essay format; you do **not need** to separate sections for each element below]

(Setup) Describe the experimental setup, half-page most. You can add a sketch or a photo if needed.

(Procedures)Describe the experimental procedures. Explain how the experimental data were collected, and if multiple data runs were used in the analysis. Raw data must be placed into Appendix A.

(Tables) The processed data shall be gathered in a table as in the example, Table 1, shown below. Include units and appropriate number of decimal places. If the table is too big, reformat it to fit into the page. Tables must have captions describing the content.

**Table 1 – Displacement, time, and velocity measurements (with absolute error)**

**of the puck with the 50g hanging weight.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| hanging weight | 50 | g |  |  |  |  |
| puck (g) | 548 |  |  |  |  |  |
| displacement # | Δx (cm) | Δt (s) | t (s) | δΔx (cm) | v (cm/s) | δv (cm/s) |
| 1 | 1.9 | 0.0333 | 0.033 | 0.3 | 28.528 | 4.504 |
| 2 | 2 | 0.0333 | 0.066 | 0.3 | 30.030 | 4.504 |
| 3 | 2.1 | 0.0333 | 0.1 | 0.3 | 31.531 | 4.504 |
| 4 | 2.2 | 0.0333 | 0.133 | 0.3 | 33.033 | 4.504 |
| 5 | 2.4 | 0.0333 | 0.166 | 0.3 | 36.036 | 4.504 |
| 6 | 2.5 | 0.0333 | 0.2 | 0.3 | 37.537 | 4.504 |
| 7 | 2.6 | 0.0333 | 0.233 | 0.3 | 39.039 | 4.504 |
| 8 | 2.8 | 0.0333 | 0.266 | 0.3 | 42.042 | 4.504 |
| 9 | 2.9 | 0.0333 | 0.3 | 0.3 | 43.543 | 4.504 |

(Theory) Discuss the relation between data and equations: which equations were used to calculate the different values in the tables.

(Errors) Clearly describe how uncertainties have been decided upon, and what equations were used to propagate errors.

(Equations) Short equations can be written in the text line, e.g. . Separately - longer equations, or the referenced ones, e.g. Eq. (1), below

 (1)

(Graphs/Figures) Explain why the data must be plotted (e.g. to check linear dependence, to calculate a slope) and how the graph was obtained. Make sure it is properly scaled, has axis labels, units, the trend line and equation for slope, correct error bars, and meaningful captions as in Fig.1 below.

**Figure 1 - Acceleration of the puck using a 50g hanging weight.**

(Analysis) Explain what is calculated using the plotted data and what value was extracted from the graph (slope, y-intercept, exponent factor). Include the equations necessary to calculate the value desired.

(Results) Include equations used to find the measured value’s error, e.g. state how the slope uncertainty was calculated. Finally, write down the main result: the measured value +/- its uncertainty (with units). Explicitly state if (or if not) it is equal to the expected value. If it is, then the Investigation was successful and the physical principles correctly applied.

(Further analysis) If it is not equal, two outcomes are possible:

a) The physical principle is incorrect [unlikely], or

b) Other factors have not been accounted for [most likely]. Those extraneous factors must be discussed. Be specific; do not just say that there was additional human error. Explicitly name a few probable sources of error (e.g. extra time lag due to reaction speed, parallax when measuring the volume, too much air on the air track, friction losses), explain how they came about, and quantify them.

**Investigation 2**

Follows Investigation 1.

**Investigation 3** (if applicable)

Follows Investigation 2.

**Conclusion**

Write a paragraph or two with the summary of the experiment's outcome. Restate all main results. Discuss how your theoretical expectations outlined in the Introduction have been supported by the experimental data. Review problems you have encountered, major sources of error, and possible ways to minimize them.

**Questions**

Answer each question at the end of the experiment. Honors questions are required for honors sections. Do not simply write the answer, rather type out the necessary algebra and always include units.

**Acknowledgements** (optional, up to +1 credit)

Here you can thank your lab partner for his/her contribution as well as any other person (fellow student, TA, professor, tutor, etc.) who provided help with the experimental work or writing.

**References** (optional, up to +1 credit)

If any resources were consulted, you can refer to them in the report. Examples: "explanation for γ-radiation absorption by solid materials [1]", "applying Eq. (24.9) from [2] to our case", "for current Boston weather conditions (provided by NOAA [3])","taking the density of Al from the NIST database [4]”, “references [3,4] are on-line resources, all Refs. [1-4] are cited in the report".

References must be numbered as they appear in the report, and listed in the Reference section:

[1] H.Young and R.Freedman, University Physics, 13th edition, Pearson Education.

[2] O.Batishchev and A.Hyde, Introductory Physics Laboratory, p.263, Hayden-McNeil, 2015.

[3] National Weather Service, http://www.weather.gov/.

[4] National Institute of Standards, <http://physics.nist.gov/>.

**Appendix A** (optional, e.g. if data was collected using automated software)

This is for raw data (other than what is in the lab report proper) that was collected but not necessarily used for analysis; includes data from Pasco Capstone or other automated software. Truncate the data down to one page, and keep only significant digits.

**Appendix B** (if applicable)

Raw data for Investigation 2.

**Appendix C** (if applicable)

Raw data for Investigation 3.