Sample Lab Report
For
PHYS221/222

This document is intended to provide guidance on how to write a lab report using the 100 point lab report format that is given on this website. *There is no such thing as a perfect lab report and there are multiple ways to present the same information*. The thing you should keep in mind is that as long as you follow the spirit of the format (to the letter) you should/will get a good grade.

The experiment that sample report is written for is called **"Work & Energy"**. The primary purpose of experiment is to examine the relationship between potential and kinetic energy by **measuring the speed and stopping distance** of a toy car that **rolls** down a ramp to the bottom where it is then **stopped by (sliding) friction**. The results are then plotted and the physics behind behavior of these plots (and data collected) are then discussed.

Please review the lab report format which is on-line.

Abstract-

The *objective* of this experiment was to examine the relationship between potential and kinetic energy and their relationship to velocity and stopping distance. The *primary equipment* used to perform this lab consisted of an inclined track, a toy car and a photo-gate connected to a computer via an interface. The *primary results* were that potential energy is converted to kinetic energy (with frictional losses) and that the relationship between velocity and kinetic energy is not a linear relationship. *Uncertainties* were not quantified in this experiment but the probable primary sources were friction and track non-uniformity.

Note on Abstract above.

The primary results given in the abstract above are qualitative in nature, whereas in some reports, the results can be quantitative or both. **For instance, if you were reporting on the results of the measurement of the acceleration of gravity**, the primary results might given as:

The result of this experiment was a measured acceleration of gravity of $9.7 \pm 0.2\ m/s^2$

Below you will find an example of two types of results where one student the emphasized **quantitative aspects** of the results of the experiment whereas another student emphasized the **qualitative aspects** of the same experiment. **Both are acceptable.**

You are reminded that plots are generally the graphical representation of some important aspect of an experiment and the primary physics demonstrated by plot(s) should almost always mentioned in the results.

Sample Lab Report
For
PHYS221/222

Results
(Sample 1- quantitative & qualitative)

Height (cm)	Average Potential Energy (J)	Average Kinetic Energy (J)	Average Velocity (m/s)	Average velocity squared (m/s)^2	Average Stopping Distance (cm)
15	0.005	0.003	1.39	1.93	0.195
30	0.010	0.005	2.09	4.37	0.373
60	0.021	0.011	2.93	8.58	0.753

Experimental plots indicate that the relationships between velocity vs. potential energy and stopping distance vs. velocity are not a linear relationships. Additionally, it is seen that stopping distance vs. kinetic energy and velocity squared vs. potential energy are a linear relationships. See plots on following page.

Results
(Sample 2-Qualitative & some quantitative)

The attached plots (see below) indicate the following concepts:

-The plot of Stopping distance vs. Velocity infers a non-linear relationship between the two.

- The plot of Stopping distance vs. Kinetic energy infers a linear relationship between the two.

- The plot of Velocity squared vs. Potential energy infers a linear relationship between the two.

- The plot of Velocity vs. Potential energy infers a non-linear relationship between the two.

Average potential energy loss (as compared to measured kinetic energy) on each run is 50%

Sample Lab Report
For
PHYS221/222

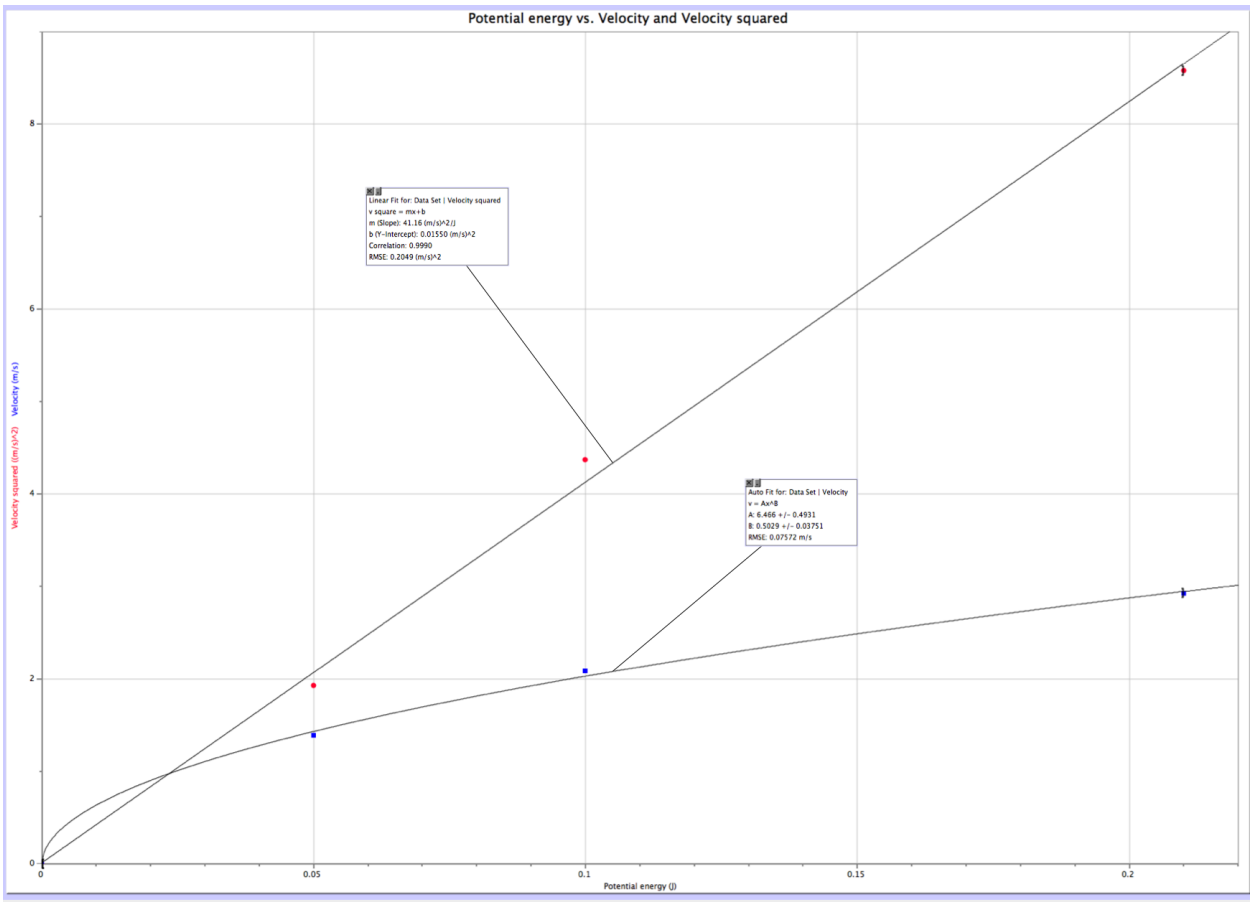

Figure 1

Sample Lab Report
For
PHYS221/222

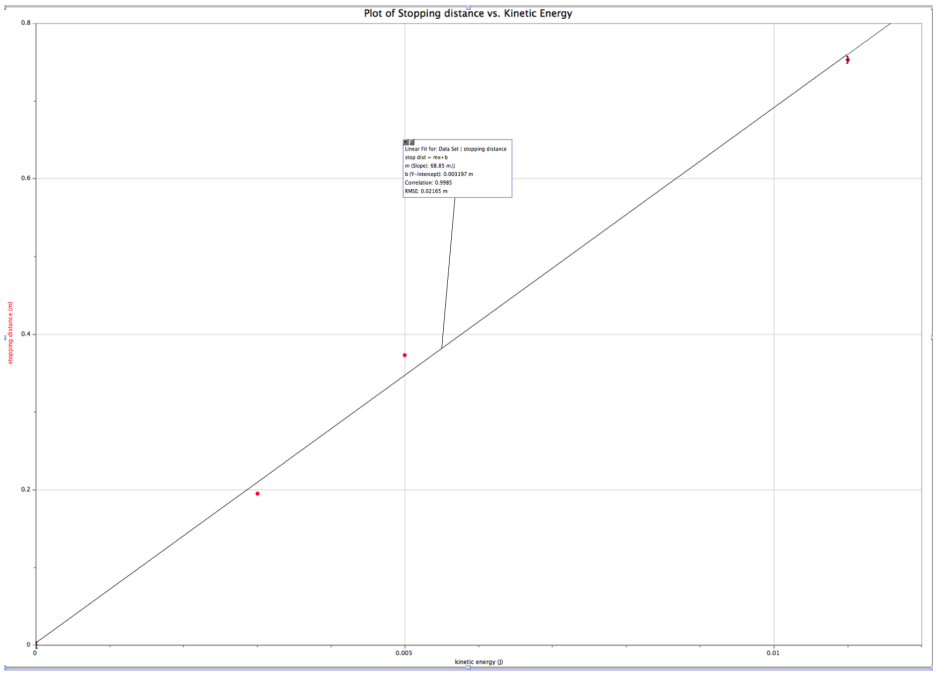

Figure 2

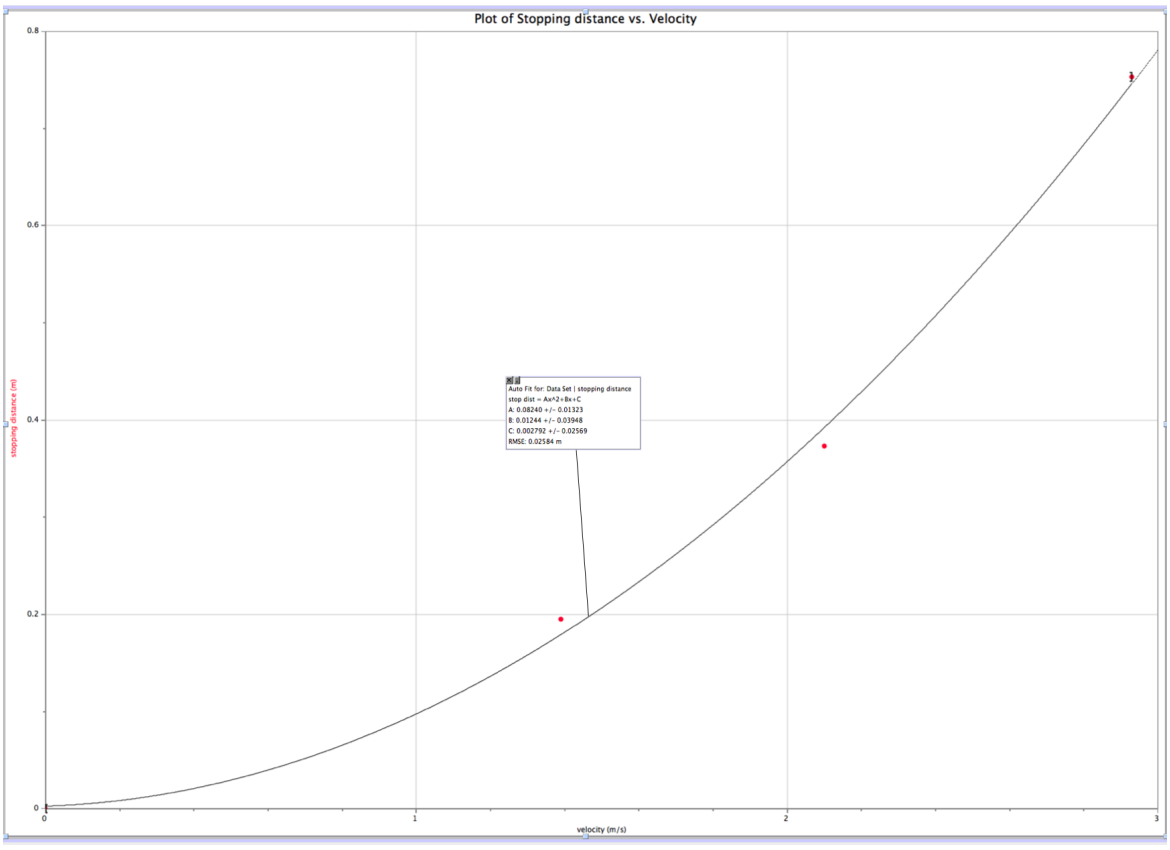

Figure 3

Sample Calculations (place here). They may be either typed or neatly handwritten.

Sample Lab Report
For
PHYS221/222

Discussion of Results

The objective of this experiment was to give a toy car a specific amount of potential energy (which was converted into kinetic energy) and then analyze the effect of kinetic energy on the stopping distance. These objectives were successfully achieved and are discussed below.

The most salient results of this experiment are gleaned from an examination of the attached plots. The plot of Stopping distance vs. Kinetic energy implies a linear relationship between the two. See Figure 1. This linear relationship implies that if the kinetic energy of a car is doubled, then the stopping distance would also double. The plot of Stopping distance vs. Velocity infers a non-linear relationship between the two quantities. The curve fit of this relationship shows that it is a 2^{nd} order or quadratic relationship. See Figure 1. This quadratic relationship is expected since velocity is squared in kinetic energy and it indicates that if the speed of a car is doubled the stopping distance increases by a factor of four.

The plot of Velocity squared vs. Potential energy indicated a linear relationship between the quantities. See Figure 2. This was expected since energy conservation implies that as the potential energy of the car is increased by a certain amount then the resultant kinetic should also increase by the same amount. The plot of Velocity vs. Potential energy infers a non-linear relationship between the two. The curve fit of this relationship shows that it square root relationship. See Figure 1. This relationship is also expected since velocity is squared in kinetic energy and it implies that if the height that the car is released is quadrupled then the velocity increases only by a factor of two (i.e., square root of 4).

An examination of the starting potential energy at the top of the track and the kinetic energy measured at the bottom of the track shows that mechanical energy is not conserved in this experiment. The average loss in potential energy is approximately 50%. The most probable reasons for this disparity are frictional losses as well as the rotational energy of the wheels. Uncertainties were not accounted for but are considered to be small compared to unaccounted for systematic errors (e.g., non-uniformity of the track).

Comments on the discussion above. You will notice that the bulk of the 'Discussion of the Results' are nothing more than an elaboration of what was given in the 'Results' section. This should always be the case. You are to discuss that which you have presented at the 'Results'.

If your report includes a plot, you should always discuss the primary physics the plot demonstrates. In general your lab experiment will emphasize only one or two physics points. You should always discuss discrepancies when applicable. You should always discuss uncertainties and errors and their effect on an experiment (you should mention even if uncertainties are not quantified.)

Lastly, the discussion above is somewhat long since four plots were discussed and you will generally not have that many to discuss.

Post Lab Questions