

Forces and Motion

This experiment is an investigation of a simple physical system in which you will try to reconcile any discrepancies between experimental measurements and a theoretical model.

The Experiment:

With the air table level, attach a light cord to the air puck, pass it over the pulley on the edge of the table, and hang a mass on the other end. Appropriate masses are 10 g, 20 g, and 50 g. Let the falling mass draw the puck across the table, leaving a line of spark points. On the same sheet of paper, make one record with each of three different masses. Then, select one of the three masses and make an additional record.

The Analysis:

From your data, determine the velocity of the puck as a function of time. Draw an appropriate graph and determine the acceleration. (Is it constant?) Use Excel as much as possible.

Determine how the puck should move based on what you have learned in the course, assuming that friction is negligible. Choose three sets of data, each for a different mass. Do your experimental and theoretical results agree? That is, are the errors you can reasonably expect in your measurements large enough to account for any discrepancies? In discussing this point, be as quantitative as possible. It is often difficult to reliably estimate expected errors. One method of determining a minimum expected error is to repeat the measurement for one of the masses and see how close the new results are to the previous results. Depending on the remaining time, you can make this comparison using your fourth data set.

What factors or assumptions affect the comparison of theory with the results of this experiment and how? How would they change from one mass to another? What experimental tests could you perform to test the validity of these assumptions?