

Physics Lab

Shoot the Cart

This lab will be assessed on all the assessment criteria.

Introduction:

In this lab you will project a low friction cart along a track using a spring. The cart will move along the track until it reaches some maximum distance. There are a number of factors which influence how far the cart will go. Your task is to derive a mathematical relationship between these factors and the distance travelled and design an experiment to test it.

Motion on an Elevated Track with no Friction

1. Set up the track with a stopper at one end and two stoppers at the other end.
2. Get a cart and a spring assembly. Attach the spring assembly to the cart and find the total mass of the cart and spring assembly.
3. Determine the spring constant of the spring.
4. Elevate the end of the track with the single stopper so that it is about 10 cm above the table. Determine the angle of elevation of the track.
5. Use conservation of energy and the quantities you have measured to calculate how much the spring must be compressed in order for the cart to travel within a few centimetres of the end of the ramp **WITHOUT TOUCHING** the stopper. After you have done this calculation show your work to me. Once you have made your prediction I will watch you as you test your prediction.

Motion on a Horizontal Track with Friction

6. In this second experiment we will use a horizontal track and a cart with a moderate amount of friction. Adjust the friction control on your cart so that there is a modest amount of friction; enough to stop the cart before it gets to the other end of the track when you give it a strong push. Measure the coefficient of friction. Your book has a good suggestion on how to do this.
7. The distance the cart travels along a horizontal track when friction is present depends on a number of different variables. Identify all the relevant variables and decide which of these you are going to investigate. (ie which of these variables you will vary and which you will keep constant).
8. Using conservation of energy, hypothesise a quantitative relationship between the distance travelled and each of the variables you wish to investigate.
9. Design an experiment that allows you to collect enough data to test your hypothesis.
10. For each variable plot a suitable graph so that the observed data can be **quantitatively** analysed and compared with your hypothesis. (That is, is the plot linear, and is the slope the correct value?)

11. Finally, evaluate of your results and your experimental procedure and comment on how successfully you were at predicting the behaviour of the projected body. Indicate any areas where you could improve your results.