Procedure for Lab7: Energy Conservation.

The goals for this lab are to determine 1) the relationship between height and speed of the roller coaster, 2) the minimum height for a roller coaster to make a complete loop, and 3) the fastest path between two points. For this experiment, we require the following equipment:

* Roller coaster
* Car
* Mass set
* Photogates
* Sparklink

For the procedure, we will divide the lab into three parts to help us identify all three goals for the lab.

Part I: Determining the relationship between height and speed of the roller coaster.

To do this we will have our height of the roller coaster as our independent variable, with the speed of the car the dependent variable. To measure the speed of the car, we will set up a photogate and connect it to the provided computer through the SparkLink hardware. Because we are measuring for speed, we will have a graph set up, plotting velocity vs time. For example, we can set the roller coaster up 1 meter high, have a photogate on both ends of the roller coaster and use it to find both the initial velocity and final velocity, and those values should give us the speed of the car. Perform the same experiment several times to obtain a good sample size of data. Then adjust the roller coaster so that it is at 75 cm. Repeat the steps mentioned above. Once the data has been collected, adjust the height of the roller coaster again so that it is at 50 cm. This should provide ample data to satisfy the first goal of the lab.

Part II: Determining the minimum height of the roller coaster to make a complete loop.

This part is slightly more difficult as we now have to account for the car performing a loop. In Part I, we could have had the track set up so that the car has to make a loop and therefore we measure the speed when the car makes that aforementioned loop. However, it may be less complex for the car to simply go down the roller coaster as if it were a ramp, an experiment we have done before. To account for the loop here in Part II, we should try to set up the roller coaster so that the car must go through a loop before it can reach the end. To find what the minimum height must be, we could use the data from Part I to determine if the speed is fast enough to complete a loop and then adjust the height accordingly based on the data. This part is a lot of trial and error, so several tests must be done to precisely determine the minimum height for a completed loop.

Part III: Determining the fastest path between two points.

For Part III, we could potentially take the data from Part I to help us determine the fastest path between two points. This is done by adjusting the height to determine the speed needed. We can then take that data, adjust the roller coaster so that we maximize the speed, and record the data.