Procedure for Lab 4

For this experiment, we are measuring the acceleration due to gravity. This can be done through using two different methods: 1. A smart cart and a track to measure acceleration due to gravity along a fixed line, and 2. An air table and a puck to study the motion of an object with gravity acting upon it and seeing if there is any acceleration.

For equipment, we have a ruler for measuring distances, a level to find the elevation of an object, a track for the smart cart to travel along, smart carts to help us record data (in this case it’ll be the position of the cart over time to determine if it is accelerating), an air table, a puck for the air table, and a camera to record the motion of the puck on the air table.

For the first method or part of the experiment, we will use the smart cart and track to measure the position of the cart going down the track on an incline. We will prop the track up using a block of wood or a stack of books, something to give elevation to the track, ensuring that at least that one end is higher than the other and that the cart can roll down by itself, a sign that gravity is acting upon it. We will then set the cart on the higher end of the track and record the position of the cart using the software provided on the computers. To understand if there is any acceleration due to gravity, we can look at the data recorded and see if the position over time is constant or if it is increasing/decreasing. If the slope of the position vs time graph is getting steeper as time passes, we then know that the speed is increasing and thus there is acceleration.

The second method involves the air table and the pucks. For this method, it is similar to the first, except we do not have a fixed line for the puck to follow. Instead, the puck is free to slide down the air table as gravity dictates the direction it will slide down. Using the camera above the air table, we can then record the motion of the puck and run it through the software, seeing its position over time. As per the smart cart, if the slope of the position vs time graph gets steeper, we then know that the puck is accelerating due to gravity acting upon it.

For both experiments, we can change the level of elevation to determine if that changes the acceleration of the object as it changes position. For a base grounds to determine acceleration, we can first set up the respective track and table flat on the surface, and gently push the cart and puck, then recording the position and time to get an idea of what that baseline acceleration looks like. Then comparing that data to the elevated surface data, we can then calculate how much of a difference there is between the two, thus measuring the acceleration of the objects due to gravity.

There are possible errors that may occur when measuring. For example, how hard we push when doing the initial baseline tests when the track and table are at neutral position may vary and will not provide consistent data. Then comes the problem of friction, is it going to affect the acceleration of the objects? To perhaps prepare for these challenges and possible errors, we will ensure that the elevated surfaces are properly measured using a level and that several tests are run to get an idea of what the mean data should look like. Performing several runs will also allow us to see if there are any unusual points with the data and that will allow us to adjust accordingly, ex. Using different ways of dropping the object down the track/table, or perhaps changing the elevation to allow for a more accurate measurement.