

PHYSICS 190: MECHANICS and HEAT; Lab 2: Freefall

1. Set up

- a. materials needed: free fall apparatus and meter stick
- b. attach free fall apparatus to a table

2. Collecting data

- a. the ball bearing should fall 2.00 m, 1.90 m, ... , 0.10 m
- b. the ball bearing should fall three times from each height

3. Data table

- a. in a spreadsheet program create a data table
- b. a set of three columns needs to be made to record the fall time data making sure that they are labeled appropriately
- c. a second set of three columns needs to be created to hold the average velocity data (use appropriate labels and units)
- d. enter the formula for calculating the average velocity into the first cell and then copy it into the others
- e. a third set of three columns needs to be created to hold the final velocity data (use appropriate labels and units)
- f.) enter the formula for calculating the final velocity into the first cell and then copy it into the others

4. Calculations

- a. graph of distance vs time
 1. pick one of your fall time columns and create a graph of distance vs time
 2. use an XY scatter graph
 3. the data points should not be connected by lines
 4. the axis should be labeled with quantity and units, i.e. distance (m), etc.
 5. when printing out a graph make it fill the entire page
- b. graph final velocity vs time
 1. repeat the above process using each final velocity column to make a final velocity vs time graph
- c. find acceleration
 1. use the trendline tool to determine the acceleration for each final velocity vs time graph
 2. find the average of the three accelerations and calculate the standard deviation

5. Questions

- a. what is the value of the acceleration for each column?
- b. what is the average value for the acceleration?
- c. what is the standard deviation of your three accelerations?
- d. is the distance vs time graph linear? should it be? why?
- e. is the final velocity vs time graph linear? should it be? why?
- f. does the standard value for the acceleration due to gravity fall within one standard deviation of your average value? should it? why?