PHY 241
Lab 3

Uniform Acceleration - Measuring g

The Behr freefall apparatus will provide a strip of waxed paper with small dots showing the position of a freefalling "torpedo" at equal intervals of 1/60 of a second.

IMPORTANT:
If you have a laptop with Excel or a similar plotting software, bring it to the lab!

Procedure and Analysis:

Make a systematic selection of at least 10 dots between the top and bottom of the strip to determine the value of **g**, the acceleration due to gravity in the lab. (Note that because of the manual release, the time between the first and second dots is not known. Hence, do not include the very first dot.) Discuss a plan of action with your partner before selecting the points and beginning measurements. The goal is to determine the acceleration due to gravity with as much accuracy as possible and to determine, within error, if **g** is truly a constant. You will use two techniques:

Method 1 - Averaging

1. Determine the average velocity between each pair of dots, then determine the average acceleration between each of your "velocity intervals". Place these calculations in a properly labeled table.
2. Determine an error for each of your velocity and acceleration calculations. Several methods for determining errors, with a specific example for this lab, can be found at ***Error Analysis***. Include those errors in the table.
3. Determine **g** from the average of your acceleration calculations. Calculate two errors in your value of **g**; one from the error of the individual values, and the second from the spread of values in the individual acceleration calculations. Discuss any significant differences in the value of these two errors.

Method 2 - Plotting

1. Using the values calculated in Method 1, create two plots - position vs time and average velocity vs time. The times for the position plot are somewhat arbitrary, but the values for the second plot should be consistent with the first.
2. From the second plot, determine **g** from the slope of the plot. You may do this by hand or use plotting software. If you determine slope by hand, describe your method clearly.

Report:

1. Fully describe your calculations, clearly justifying your choice for time intervals.
2. As with all lab reports, show one sample for each unique calculation. (For this lab, there should be one sample for the average velocity calculation, one for

acceleration, one for the average, and one for slope if. Include your error in those samples.)

3. Discuss your results, including an analysis of errors. Are values consistent with what you expected? Be sure to discuss your plots - are there anomalies, do curve fits seem reasonable, etc.