Uniformly Accelerated Motion

As you work through the steps in the lab procedure, record your experimental values and the results on this worksheet. Use the exact values you record for your data to make later calculations.

Procedure A: Set-up and data acquisition

What is the measured distance between leading edges of bands?

CHECKPOINT 1: Ask your TA to check your Excel worksheet before proceeding.

Complete the data table below. *Note*: You must enter values in the first three columns of the data table to 5 significant figures to avoid rounding off errors.

Data Table 1:

time t (s)	t_{avg} (s)	$\overline{v}$ (m/s)	$\overline{a}$ (m/s^2)

Procedure A: Calculating the acceleration

From this point forward please round your calculations to the WA default value of 3 significant figures except in the case of uncertainty.

What is the average acceleration from your data table?

What is the percent uncertainty in your measurement of the acceleration $\overline{a}$?

What is the percent error between the experimental value of the average acceleration and the accepted value of the acceleration due to gravity?

Do they agree within the range of your experimental uncertainty? (Compare your percent uncertainty and your percent error exactly as you have entered them.)

Procedure B: Plot of velocity versus time

Use Excel to create a graph of velocity versus time. Use the LINEST function to determine the average acceleration and its uncertainty from the slope of this graph.

What is the percent uncertainty in your measurement of the acceleration $\overline{a}$?

What is the percent error between the average acceleration you obtained from the graph and the accepted value of the acceleration due to gravity (9.81 m/s^2)?

Do they agree within the range of your experimental uncertainty? (Compare your percent uncertainty and your percent error exactly as you have entered them.)

What are some of the sources of uncertainty in this lab that could have contributed to the discrepancy in the two data sets? (Select all that apply. *Note: The order of these options may be different in the WebAssign question.*)

- picket fence not dropped vertically
- human error
- incorrect measurement of the value of c

CHECKPOINT 2: Ask your TA to check your graph and calculations.

Procedure C: Predicting v using kinematics

Using your experimental value of g (as obtained from your graph), predict the value of the velocity when the fence is dropped from a height of $h = 0.15$ m.

What is the experimental value of the average velocity when the fence was dropped from a height of $h = 0.15$ m?

What is the percent difference between $v_{\text{predicted}}$ and $v_{\text{experimental}}$? (Percent differences should not be rounded to one significant figure.)

CHECKPOINT 3: Ask your TA to check your graph and calculations.