Experimental General Physics for Engineers I

Laboratory Report PHYS 192 spring 2022

Section: __L06___

Experiment name: Free Fall

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Table of results (1.25 pts)	
Graph (1.25 pts)	
Data analysis (2 pts)	
Discussion (0.5 pt)	
References	
Others	
Report Grade (5 pts)	

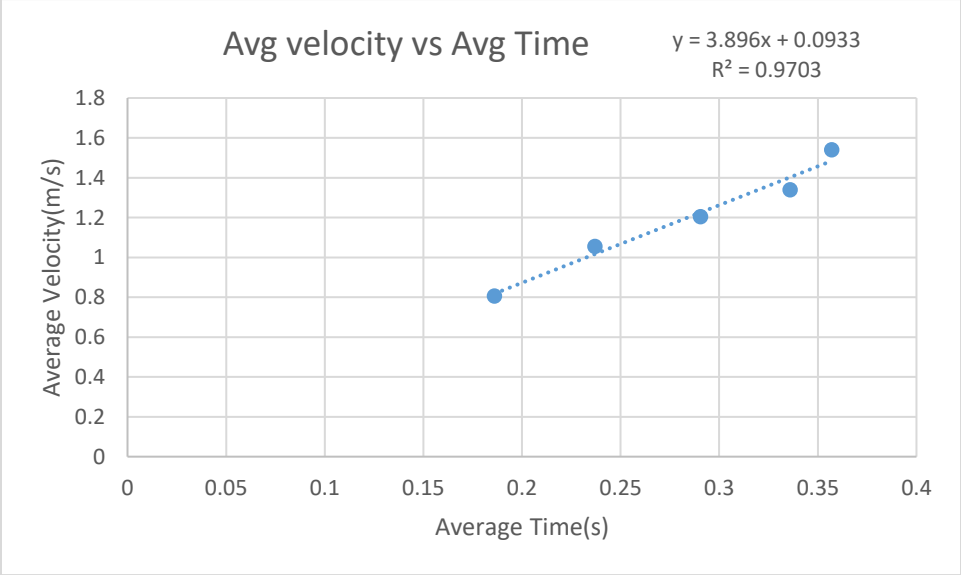
1. Table of results (Put correct units in the tables)

Δy (m)	u (Δy) (m)	Time t			t_{av} (s)	$\frac{\Delta y}{t_{av}}$ (m/s)
		t_1	t_2	t_3		
0.15	±0.001	186.5	184.99	186.37	0.185953	0.806654
0.25	±0.001	237.54	236.68	236.68	0.236967	1.055001
0.35	±0.001	291.9	290.16	289.69	0.290583	1.204474
0.45	±0.001	355.44	323.95	328.57	0.335987	1.339339
0.55	±0.001	357.8	357.94	355.2	0.35698	1.540703

2. Graph of $\frac{\Delta y}{tav}$ vs. t_{av}.

Insert the graph here

Don't forget the axes titles, and units.



3. Data analysis

3.1. Uncertainty of the timer.

Give the uncertainty (precision) of the device you use to measure time.

We take smallest number displayed on the time measurer

± 0.01 ms

3.2. The error of the mean of the time.

Show explicitly how to calculate error of the mean of the time for the first row

Xm =(x1+x2+x3)/3

= (186.50+184.99+186.37)/3= 185.9533

Standard Deviation of T= sqrt((186.50-185.953)^2+(184.99-185.953)^2+(186.37-185.953)^2)/2)

= 0.8368

SDOM =0.8368/sqrt(2) = 0.592

Xm + SDOM = 185.933 ± 0.592

3.3. The error of Δy/tav.

Show explicitly how to calculate propagated error of Δy/tav for the first row

Δy/tav= sqrt((-Δy/tav) x u(tav))^2+((1/tav)*u(Δy))^2)

= sqrt((-15/0. 185953) x 0.592)^2+((1/0. 185953)x(0.001)^2))

=sqrt(2280.44+0.000028)

=sqrt(2280.440028)

=47.753 %

3.4. Slope and intercept of the graph and their errors.

Use the linest function to find them

Y=mx + c

M=slope, c=intercept

Trendline equation: 3.896x + 0.0933

Slope: 3.896039	Intercept: 0.093301
Slope Error: 0.393201	Intercept Error: 0.113347

3.5. Value of the acceleration of gravity g.

From your result, in point 1.4 above calculate your experimental value of g. (Show your calculation)

$\frac{\Delta y}{t}$ = ½ gt +v0

Slope, y= mx + c

Comparing two equations, we compare and find the value of gravity g

g=2*m

From the slope m=3.896

g=2*3.896 = 7.792 m/s^2

3.6. The propagated error of g.

Show explicitly how you calculated the error of g.

g=2* slope u(slope)=0.393201

u(m)=2*u(m) = 2* 0.393201

= 0.786402

g=7.792 ± 0.786402 m/s^2

3.7. Comparison with accepted value of g.

Find the error percentage between your value and the commonly accepted value for g.

The accepted value or actual value of g is 9.81 m/s^2.

Comparison=| (9.81-7.792) / (9.81) | *100 = 20.57 %

4. Discussion.

(Give a brief comment on whether your results are in agreement with what was expected or not and mention all the possible sources of error that you may have faced during the experiment).

The result obtained is 7.792 m/s^2 compared to the accepted value 9.81 m/s^2, which is not satisfying and can be the result of possible sources of error that have given a difference in the results obtained in the experiment.

Sources of Error:

1) Holding magnet excessive hold on to the steel ball due to the strength of the magnet. The magnetic effect might have caused some millisecond difference in the dropping of the steel ball to reach the contact plate.
2) Air resistance, or the room temperature also might have caused few errors in the reaching of steel ball to the contact plate
3) Human error, where we might have caused slight error in the Δy, either a little higher or lower could have possibly caused small errors

References