PHYS 1401 **Free Fall**
Table____

Names: _____
_____

_____
_____

Equipment: Pasco Free Fall Apparatus & Smart Timer

Objectives: measure time and distance, calculate average and instantaneous velocities, calculate acceleration, calculate average deviation from the mean, and interpret data.

Procedure:
1) For five different heights, measure and record height of fall h and time of fall t with the **greatest amount of precision** and accuracy possible. Start at the highest height possible. Decrease h somewhat for each subsequent trial.

1	2	3	4	5	6	7
h = height of fall	time of fall Trials	Average of time-Trials t	Average Speed $v_{av} = \frac{h}{t}$	Speed ball hits the ground $v_f = 2v_{av}$	$a = \frac{v_f}{t}$	Deviations from average $\lvert a - a_{av} \rvert$
(m)	(s)	(s)	(m/s)	(m/s)	(m/s/s)	m/s/s

Complete the calculations in columns 3-6. (Column 7 will be done later)

2) Calculate the average of all the values in column 6 in the table.

measured average acceleration: a_{av} = _____ m/s/s

3) Calculate the percent error of your measured average acceleration from the accepted value of 9.8m/s/s.

$$\%Error = \frac{measured - accepted}{accepted} \times 100\% =$$ _____

4) Column 7 in the table is the (absolute value) of the deviations from the average. Use the value of a_{av} above to calculate & fill in the last column.

5) The average of the last column is called the **Average Deviation**. Calculate this average and record:

Average Deviation = _____ m/s/s → Round it to 1 sig. fig. = _____m/s/s

Report your experimental average-acceleration to the same decimal place as the 1 sig. fig. average deviation (e.g. average acceleration = 9.4123m/s/s, average deviation = 0.0345m/s/s, then report 9.41 +/- 0.03 m/s/s.)

Experimental value: g = _____ +/- _____ m/s/s
(average accel.) (1s.f. Average Deviation)

Summing Up

1. Is the speed the ball hit the ground at proportional to the height it was dropped from? (In other words, if dropped from double the height is the speed doubled as well?) Use a calculation to support your answer.

2. What measurement do you think caused the most significant error in your acquired data?

_____

Was this a randomly up and down error or did this issue always cause a value to be too large, or always too small? Explain.