Name, Date, Hr/Per_____

DETERMINATION OF GRAVITY

Objective: To determine the acceleration due to gravity on Earth

Materials: Ball, stopwatch, pencil, graph paper, ruler, meter stick/measuring tape, calculator

Theory: acceleration due to gravity = 2(height) / time^2 OR $g = 2d/t^2$

PROCEDURE: Each group will choose three heights to take measurements.

1. Designate one person to signal and drop the ball, one person to time with the stopwatch, and one person to record data. (***of course you may choose to take turns***)
2. Measure the distance for your first height with the meter stick or measuring tape. Make sure to note the height from where you drop the ball so your data will be accurate. Record the height in the blank beside "Height 1" in the "Your Group" table.
3. Drop the ball from your designated height and time how long it takes to reach the ground. Record the time taken in the "Your Group" data table. **Don't throw the ball; just drop it.**
4. From the same height repeat steps 1-3 for four other trials (for the same height). Record your observations in the data table.
5. Repeat steps 1-4 for two other heights.
6. Find the average time taken for each height and record in the table below.

OBSERVATIONS/DATA: Your Group:

	Height 1 _____ m	**Height 2 _____ m**	**Height 3 _____ m**
Trial #	**Time (s)**	**Time (s)**	**Time (s)**
1			
2			
3			
4			
5			
Average Time →			

[Procedure, Continued]

7. Share your data from one of your heights with the class by putting it on the board. Record the class data in the table labeled "Your Class". Be sure to include the data you shared in the "Your Class" data table.
8. Find the square of the average time taken for each height. Complete the row for Gravity, using $g = 2d/t^2$ (where d is height). Find the average gravity.
9. Make a graph (***Graph #1***) plotting distance fallen on the y-axis and **avg.** time to fall on the x-axis. **Make sure you label your axes and give your graph a title (y-axis label vs x-axis label). Spread your graph out over the entire area.** Connect the points.
10. Draw a graph **(*Graph #2*)**, plotting distance fallen on the x-axis and (avg. time to fall)^2 on the y-axis. **Make sure you label your axes and give your graph a title (y-axis label vs x-axis label). Spread your graph out over the entire area.**
11. **ON GRAPH #2**, Draw a straight line that fits the data points and is the best average representation (i.e draw a best fit line). Draw a straight line such that you have equal number of points on either side of the line. Find the slope of your best fit line. [slope = rise / run OR – choose two points on your graph: $(y_2 - y_1) / (x_2 - x_1)$
12. Divide two by the slope of your best fit line (2 divided by the slope). Compare this value to the acceleration of gravity (9.8 m/s^2) by calculating percent error for the experiment. The lower the percent error, the better your data. Percent error = $\frac{\text{(your result - accepted value)}}{\text{accepted value}} \times 100\ \%$

OBSERVATIONS/DATA: Your Class:

	Ht. 1 _____m	**Ht. 2 ____ m**	**Ht. 3 ____m**	**Ht. 4 ____m**	**Ht. 5 ____m**	**Ht. 6 ____m**	**Ht. 7 ____m**	**Ht. 8 ____m**	**Ht. 9 ____m**
Avg Time (s)									
(Avg Time)^2 (s^2)									
Gravity (m/s^2) $g = 2d/t^2$									

Average Gravity (m/s^2)	

Graph 1:

Graph 2:

Graphs = 32 x 32

SHOW ALL WORK FOR CALCULATIONS, AND ANSWER THE FOLLOWING QUESTIONS ON A SHEET OF LINED PAPER. DON'T FORGET TO ATTACH IT.

1. **GRAPH # 1:** Was the ball speeding up, slowing down, or remaining constant? *(Hint: Look at your graph.)* Explain.
2. **GRAPH # 2:** Was the ball speeding up, slowing down, or remaining constant? *(Hint: Look at your graph.)* Explain.
3. Calculate percent error, using the formula: $\left|\frac{\textit{average gravity} - 9.8}{9.8}\right| \times 100$ =
4. What reasons can you think of to explain your error?
   (None, I'm perfect, Because I said so, etc. are not valid reasons!)
5. From what you know about the acceleration of gravity, is there anything wrong with the acceleration you found? Explain.
6. Make a RESULT/CONCLUSION statement that addresses your objective from this lab (see 1st page) and determines whether you met it or not.