Name: _____ Class: _____ Date: _____

Gravity Drop Day #2

Goal: Explore Earth's gravity by comparing how long an object has fallen to how fast it was going by the end of its fall.

Materials:

- CPO physics stand
- Marble Dropper
- One marble (diameter = 0.019m)
- Timer
- Two photogates
- Calculator
- Rulers

Procedure:

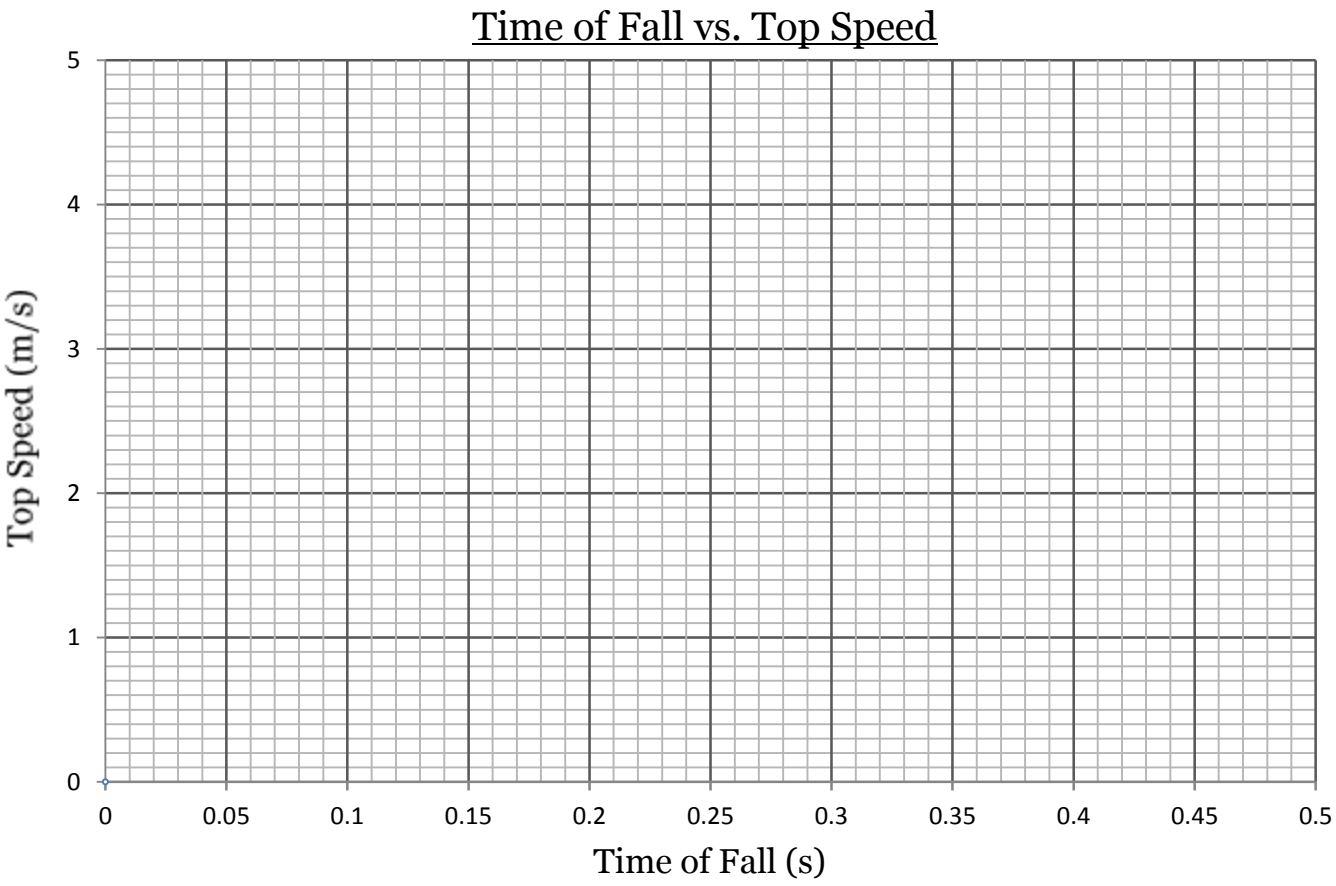
1. Set 1st photogate just below marble dropper (as close as possible).
2. Move 2nd photogate to required distance below dropper.
3. Set timer to Interval Mode. Turn on both Gate A and Gate B.
4. Insert marble into dropper. Drop marble through photogates.
5. If it was a "good drop" (marble was caught by marble catcher), then record how long the marble took to travel from upper gate to lower gate (Time of Fall).
6. Turn on just Gate B (the lower gate). Record how long it took the marble to pass through Gate B. (You do not need to re-drop the marble. The computer will remember the time through Gate B!)
7. Calculate marble's Top Speed (0.019 ÷ time) at the lower photogate.
8. Move the lower photogate to next distance. Repeat steps 4-7 for all eight distances.

Data Table:

Drop Height *How far down is 2nd photogate?*	**Time of Fall**	**Time Through Lower Gate**	**Top Speed** *(at Lower Gate)*
0.0 m	0	0	0
0.1 m			
0.2 m			
0.3 m			
0.4 m			
0.5 m			
0.6 m			
0.7 m			
0.8 m			

Graphing:

Make a line graph of your data, below. Keep in mind you are comparing time (how long did the marble fall?) to top speed.



Post-Lab Conclusions:

1. Draw a line of best fit through your data points.
2. Write the equation for the above line in *"y = mx + b"* form.

3. Does the slope of the line seem familiar? Recall what we learned Monday about Earth's acceleration due to gravity.

4. Use your equation to figure out how fast an object would be traveling if it fell on Earth for 12 seconds.

5. **CRITICAL THINKING:** Ancient people used to think that "What goes up must come down." In other words, just like your graph above, they thought Earth's gravity always had the same strength. So when a rocket ship takes off from Earth, why doesn't it eventually fall back down?