

IB Physics SL1 – Gravity Force Lab

Today, you will use the Gravity Force Lab PhET Simulation to investigate what the gravitational force between two objects depends on and experimentally determine the Universal Gravitational constant, G .

PreLab and Beginning Observations

1) Write the formula for the force of gravity (Law of Universal Gravitation). Label each variable and constant and include its units.

2) Open the Gravity Force PhET Simulation. What can you change about the simulation?

Part 1 – Qualitative Observations

3) Look at the formula above. What three things can you change in the formula that you can also change in the simulation?

4) Change each variable and record what happens to the gravitational force as you change it. Be specific with your language (i.e. use terms like increase, decrease, remains constant).

Part 2 – Quantitative Measurements

In this section of the lab, you will develop your own method for determining the gravitational constant G in the formula for gravity using the simulation and Excel.

Possible ideas

- Change mass 1 and keep mass 2 and the distance constant and record gravitational force.
- Change distance and keep mass 1 and 2 constant and record gravitational force.

In both of these examples, think about what you would graph and how it would allow you to determine the constant G . Can you get your slope to represent G only? How much data should you collect given your time constraints? The more data points the better, but don't run out of time.....

You will need to do the following:

1. Write out a procedure in numbered steps.
2. Create a numbered and titled data table with all your raw data (table 1) and processed data (table 2). Note: "Raw Data" and "Processed Data" do not qualify as titles for data. Please include ESTIMATED uncertainties for both mass and distance in Table 1. Then include CALCULATED uncertainties for data processing (any math you do to do the raw data) in Table 2.
3. Include sample CALCULATIONS (word formula + 1 solved example) for each type of calculation.
4. Figure out a way to graph the Newton's Universal Gravitation equation so that the slope will help you estimate a value for G. Include ERROR bars for both your X and Y axis. Make sure best fit line is annotated with the equation and slope in LARGE (20 pt) font. If you took careful measurements, you shouldn't need a min and max line since your error bars should be very small.
5. Draw a conclusion that states your estimate for "G" along with a reasonable uncertainty. Then calculate a % error using the actual value for G. Be consistent about your significant figures and decimal places.
6. UPLOAD the PDF of your lab report (all of the above) into Turnitin.com by Sunday, November 18th, 2018 at 10 p.m.
7. Do NOT submit until you have double checked with the IA rubric (old) to make sure you have attended to all pertinent details.

