PhET Pendulum Lab

http://phet.colorado.edu/sims/pendulum-lab/pendulum-lab_en.html

Run the above program, which will simulate the motion of a pendulum and allow you to change the variables of mass, length, and amplitude.

Also open an Excel spreadsheet to collect and analyze your data

1. How does the period of the pendulum depend on the amplitude of the swing?
   Be sure to keep the mass and length constant
   - Click on the button on the lower right which will activate the photogate timer
   - Set the amplitude to 50° and start the pendulum.
   - Start the photogate timer – this will automatically stop itself when it has recorded the time for one complete swing (period)
   - Enter the amplitude and period in excel – **be sure to label the top of each column and the correct units**
   - Continue to take readings for 40°, 30° and so on down to 10°
   - High light the columns on your spreadsheet and insert a scatter plot of your results.
   - **Choose a chart layout that will allow you to give the graph a title and label the axes with complete units**
   - Click on the chart itself and look for the layout tab
   - Open the trendline option and then open "more trendline options"
   - Select linear trendline, and display equation and r^2 on graph
   - Try other trendline options, (exponential, etc) until you find the one with **an r^2 value closest to 1**
   - Save the table, graph and trendline information
2. How does the period depend on the mass?
   - Create another data list in your excel spreadsheet, this time label the axes mass (kg) and period (s)
   - Keep the amplitude constant at 30°, and length constant at 2 m
   - Gather data for 10 different masses, and enter results in your spreadsheet
   - In the same manner as you did above, generate a scatter plot and label the axes
   - As above, generate a trendline and find the equation and r^2 value and save
3. How does the period depend on the length?
   - Keep the amplitude at 30°, the mass at 1.00 kg, and gather data for 10 different lengths
   - Enter your data in the spreadsheet, labeling axes appropriately
   - Generate a scatter plot as above
   - Analyze the graph as above.

Submit 2 documents to your instructor via email

- **Excel** document that includes data sets, graphs and analysis for all three variables
- **Word** document that answers the following questions in complete sentences:
  a. Which variable (length, amplitude, mass) has the greatest effect on the period of the pendulum? Defend your answer by discussing each graph
  b. Which variable appears to have NO effect on period? Again, defend this answer by referring to your graph