Name: ___________________ Station Number: ___

Measuring Planck's Constant

A turning point of modern physics was the explanation of the photoelectric effect. For this lab you will be determining the value of Planck's constant and analyze the properties of the graph. You will be marked on **proper form** as well as accuracy.

Procedure

1) Open up ***Vphotoelectric.exe***.
2) In the bottom right corner check **Unknown Metals**.
3) On the top of this page is your station number. Type in your station number in the box beside the "4". (throughout the experiment the radio button beside the "4" should be checked i.e. it should look like this ⦿ 4 and your station number should be beside it... if not, your data will be wrong!!)
4) Setup a chart with 3 columns to record the wavelength of light used, the retarding voltage to just stop the photocurrent and the frequency of the light (to be calculated later). You will be **recording 6 wavelengths** of light and the corresponding **cutoff voltage**, so be sure you have enough room in your chart. **Be sure the retarding voltage is zero at the start!!**
5) Your chart should start from the largest wavelength that generates a photocurrent and go down to the smallest wavelength. Space other wavelengths appropriately.
6) Plot the data with frequency going from 0 to 8 x 10^{14} Hz on the x-axis and the Cut Off Voltage ranging from -3 to 3 V on the Y-axis. (turn the graph paper sideways so the page is longer in the "x" direction).
7) Draw a line of best fit going through the points and continue the line until it hits the y-axis. Use proper form to find the slope of the line. Do calculations neatly on the graph.

Now answer the following questions involving the experiment.

8) Why is the y-axis really the kinetic energy of the photoelectrons? (Explain CLEARLY!!)
9) What are the units of this energy?
10) Convert the slope of your line to involve Joules. Remember 1 eV = 1.6 x10^{-19} J. Compare this value to the accepted slope of 6.63x10^{-34} Js. Calculate the percent error.
11) What does the x-intercept of the graph represent?
12) What does the y-intercept of the graph represent?
13) The y-intercept should have a negative voltage of 1 + 0.06*(Station Number). Do a percent error calculation on the graph comparing your value to the accepted.
14) If you were to redo the experiment with a group number of 33, the y-intercept would be -2.98 V. Draw on the graph what the line should be for this y-intercept.
15) What is the x-intercept of this line?
16) Calculate the x-intercept value that you should have gotten. How close were you?
17) Discuss any errors involved with the experiment.
18) Photoelectric effect solved the problem that increased intensity did not create photoelectrons if no photoelectrons were initially generated. Clearly explain why.