Student's Name: ______________________________ Student's Name: ______________________________

Lab day & time: ___________________ Date: __________________

Photoelectric Effect (E10) - Data Sheets

Activity 1: Measurement of the h/e Ratio and the Work Function. *(5.5 p.)*

$\left\{e = \text{the charge of an electron} = 1.602 \times 10^{-19} C\right\}$

The **stopping voltage** V_S for Mercury line spectrum (on both sides of the white line):

Color	**Yellow**	**Green**	**Blue**	**Violet**	**Ultraviolet**
Frequency (Hz)	$5.187*10^{14}$	$5.490*10^{14}$	$6.879*10^{14}$	$7.409*10^{14}$	$8.203*10^{14}$
Filter	Yes - yellow	Yes - green	No	No	No
V_S (V) (left side)					
V_S (V) (right side)					
Average stopping voltage V_{SAV} (V)					

Create a graph of the average stopping voltage V_{SAV} (on the vertical axis) vs. frequency f (on the horizontal axis). Find the best-fit straight line. Using the slope and the y-intercept values from the graph, calculate the value of the *h/e* ratio and the work function divided by the charge of electron ϕ/e. Be sure to include units. If you need help with creation of the straight-line fit (a "trendline" in Excel), then check the pdf file "How to Make a Straight Line Fit in Excel" available in Brightspace course folder.

The "$(h/e)_{exp}$" value calculated from the slope of the stopping voltage V_{SAV} vs. f graph:

$(h/e)_{exp}$ = __________________ (V*s)

Does your value for Planck's constant divided by the charge of electron $(h/e)_{\exp}$ agree with the most accurate experimentally determined value of the $(h/e)_{accurate} = 4.1361*10^{-15}$ V*s? What is the absolute value of the percent difference between your result and the best experimental value?

$$\text{Percent difference} = \left|\frac{(h/e)_{\exp} - (h/e)_{accurate}}{(h/e)_{accurate}}\right| \times 100\% = \_\_\_\_\_\_\_\_\_\_\_\_\ (\ \%\ )$$

The work function divided by the charge of electron ϕ/e value from the y-intercept of the stopping voltage V_{SAV} vs. f graph (see Eq. 2):

$(\phi/e)_{exp}$ = _____________ (V)

The equipment manufacturer - PASCO Scientific specified the value of the work function for their photocell as: $(\phi/e)_{PASCO} = 1.43 \pm 0.03$ V

What is the absolute value of the percent difference between your result and the factory specified value?

$$\text{Percent difference} = \left|\frac{(\phi/e)_{\exp} - (\phi/e)_{PASCO}}{(\phi/e)_{PASCO}}\right| \times 100\% = \_\_\_\_\_\_\_\_\_\_\_\_\ (\ \%\ )$$

You should prepare the final version of the graph using a computer-graphing program (e.g., MS Excel). These programs offer 'linear fit' or 'trendline' options to obtain the value of the slope and the y-intercept of the best-fit line.

Complete the lab report and return it to the lab TA.