Data Analysis/Conclusion

~~At~~ a point indexed i we have $\Delta V = -V$

(at $i = 400$ we have ~~40~~ $\Delta V = 0$)

At $+V$ we will have $i = 400 + (400 - i)$ so $i = 800 - i$

Now, we have the adjusted data. It is worth noting that because of the region over which we took our data, there is no adjustment for $|\Delta V| > 1$.

$V_c = h\frac{\nu}{e} - \Phi\frac{1}{e}$ for a ~~wavelength~~ frequency ν, work function Φ

Φ will be constant across all of the data since we are using the same material throughout the experiment.

$$V_{c[i]} = h\frac{\nu[i]}{e} - \Phi\frac{1}{e} = \frac{1}{e}(h\nu[i] - \Phi)$$

So if we plot the cutoff potentials vs. wavelength we should be able to curve fit for h and Φ, getting the expected value for h.

λ ~~m~~	365	405	436	486	546	577	589
V_c	-1.605	-1.25	-1.045	~~-1.045~~ -0.79	-0.53	-0.42	-0.38

$\lambda\nu = c$ $\quad \nu = \frac{c}{\lambda}$

So we find h to be $\boxed{~~+~~3.8673 \cdot 10^{-15}\ [eVs]}$, which is ≈ 0.94 times the accepted value of $4.1357 \cdot 10^{-15}\ [eVs]$

The work function was $\boxed{1.595\ [eV]}$ which is ≈ 0.70 times that of potassium, ~~However, the~~ which is generally measured to be $2.29\ [eV]$. However, the photocathode is not pure potassium ~~so~~ so this makes sense.

$2 \times 2 \times 2$

Equipment: Kitty - Lamp
Idriss - 1 or 4

Ideas: Kitty - Light/Matter
Idriss - Work Function

Data Analysis: Kitty - Curve Fitting
Idriss -

$0 < f < 1$

$I(v) = I(+v) + f\,I_{(-v)}$

$I'_{(-v)} = I_{(-v)} + f\,I_{(+v)}$

$I_{(+v)} = \dfrac{I'(+V) - f\,I'(-V)}{1 - f^2}$

So now we need f.

$f = \dfrac{I'(-V)}{I'(+V)}$ for $V > V_c$. SO, we'll do this for all $V > V_c$ and take the average

Now that I have them offset so I can see distances from V_c, I need to make a ~~set~~ new array of f to average.

The array will be $f[i] = \dfrac{I(+V)}{I(-V)} = \dfrac{I(V[i])}{I(-V[i])}$

✓ So first I need to select V and -V.
✓ Now I need to read I at these points.
✓ Now I need to create an array for f.
~~It may be easier to curve fit?~~

I initially tried to find an offset of V_c. Without doing that, this is ok

For $c = a + b$ we wish to find $d = a - b$.

~~If $a + b = c$, then $b = c - a$. So we wish to find~~

~~$d = a - b = a - c + a = 2a - c$~~

365	$241 \leftrightarrow 242$
405	$277 = 0$
436	$297 = 0$
486	$323 \leftrightarrow 324$
546	$349 \leftrightarrow 350$
577	$360 \leftrightarrow 361$
589	$364 \leftrightarrow 365$

In Excel for python, subtract 2 due to positioning (starting row & header)

~~To match~~

~~240 =~~ $239 = 2(239.5) - i$?

$V_0 \quad f = \dfrac{I(V_0 + a)}{I(V_0 - a)}$

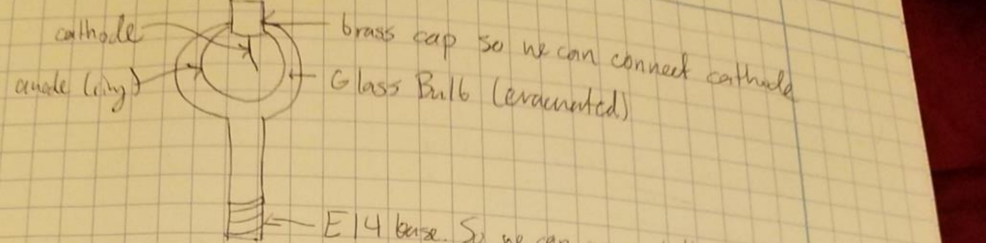
So if and $f \neq 0$:
if $f = 0$ it still works
~~if~~ $-V$ is in bounds: adjust
else: $I_n[i] = i$

A lot of this is incorrect bc of misinterpretation.

Photoelectric

Prelab

5)



Data will be saved to Excel, but run analysis in something else, such as python.

Run V from -4 to 1, not -4 to 4.
Keithley is Comm 1, not Comm 2
Click out of a box to confirm input.

We will need to make our own voltage column & current label.

Now that we've obtained our data, we need to correct it for the anode's current contribution. To do so:

> We need to find the cutoff potential ($I_{ca} = 0$)
~~> To do so, we should do a curve fit.~~

I plotted then data in bokeh to find V_c.

~~Wavelength~~ All ±0.1 [V]

Wavelength	365 [nm]	405 [nm]	436 [nm]	486 [nm]	546 [nm]	577 [nm]	589 [nm]
"V_c"	~~-1.606~~ -1.605 [V] ±0.1	-1.25 [V]	-1.05 [V]	-0.785 [V]	-0.525 [V]	-0.415 [V]	-0.355 [V]

656 [nm]: This data is very noisy and relatively flat, but there is a **clear** increase if we zoom in on this data alone. So we will do a linear fit for the linear portion?

- We are near the limit of the picoammeter
- Intensity of the lamp is ~~near~~ too low to get a good reading at this f/λ
- Near cutoff frequency? (Unlikely; too ~~near the~~ close to a normal curve toward the right).

Chart for intensity shows next to nothing past 600 [nm]