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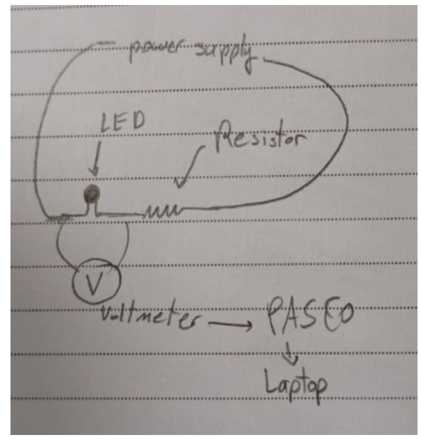
Hypothesis: We want to determine Planck's constant by using commercially available LEDs through the measurement of their turn-on voltage.

Using the equation: $e\Delta V = hf$ where the light frequency is given by the graphs in appendix A. Then, by doing a linear fit of the stopping potential over multiples frequencies, the slope will be the plank constant divided by e. By building the setup below and using the PASCO trough the laptop to slowly increase the potential until the LED starts to light up.

Equipment: Voltage/current supply, LEDs, resistor, voltmeter, breadboard, PASCO, laptop.

We will use the following LEDs one at a time in a set up similar to the sketch on the right. These LEDs are chosen as our frequencies since the light they emit are visible and is a single peak in the spectrometer in appendix A:



Yellow	a) (~590Hz)	b) (~585Hz)
Red	a) (~625Hz)	b) (~630Hz)
Orange	a) (~605Hz)	b) (~610Hz)

We had to balance the number of points which will decrease the statistical error and the systematic error coming from the wavelength of each of them to minimize the overall error on the plank constant. We ended up only using 6 LEDS because they were the only one with standard error on the distribution in appendix A seemingly under 25nm (approximately 10nm for all yellow and red and around 5nm for both orange). To compensate the low number of LEDs we will do a weighted average of multiple runs for the stopping potential of each LED to make sure the 6 points are right. To decrease the statistical error, we could use the UV LED a) and b) which also has a precise wavelength but isn't visible to the naked eye, we would thus need some sensor in order to use it. On the other hand, to decrease the systematic error we could get a more precise voltmeter since the one used in the lab has a precision of 0.01V.

The value of the plank constant for an individual frequency would thus have an error around 2% of the experimental value since the error propagation is done trough $\sigma_h = h * \sqrt{(\frac{\sigma_{\Delta V}}{\Delta V})^2 + (\frac{\sigma_f}{f})^2}$ and the error on the voltage should be around 1% (~0.01/1) while the error on the frequency around 1% (~10/600).