Lab 7 Rydberg Constant Tasks

Reports due Saturday, November 21st and December 5th at 5pm
Read Ch. 2, sections 2.6-10 in your Lyons text (pp 56-70)

The particular wavelengths emitted (and absorbed) by each element are unique, but in the 19th century there was no understanding of the origin of each element's spectrum. In 1888, Johannes Rydberg came up with an empirical formula that matched the experimentally observed sequence of wavelengths emitted by **hydrogen**:

$$\frac{1}{\lambda} = R_H \left(\frac{1}{n'^2} - \frac{1}{n^2} \right).$$

Here n and n' are positive integers (with $n > n'$) and R_H is a constant, now known as the Rydberg constant for hydrogen. The integer n' corresponds to various "series" of spectral lines (corresponding to sequential values of n), with the best known and first discovered being the $n' = 2$ Balmer Series that is observable in the visible spectrum. Others include the $n' = 3$ Paschen Series in the infrared and the $n' = 1$ Lyman Series in the ultraviolet, both of which were observed in the first decade of the 20th century, after Rydberg put forth his formula.

Your tasks are:

- Choose three different Geissler tubes and make qualitative measurements of their line spectra (e.g. how many spectral lines can you see, what colors are they, at what orders can you see them, etc.).
- Make measurements of the visible Balmer Series wavelengths (you'll likely only be able to see the first 3 lines) and use these to find as precise and accurate a value of the Rydberg constant as possible.