Spectrum Activity

I. Purpose:

The purpose of this lab is to predict the color of hydrogen's line spectrum

II. Procedure

A. Background:

1. Different substances give off different colors of light when burned.
2. This happens because electrons can only exist in definite (quantized) energy levels. Electrons can only have certain and definite amounts of energy and there are no in-between levels.
3. When energy is pumped into an atom, such as through heat or electricity, the electrons jump to higher levels.
4. These electrons are not stable in higher levels and return back to lower levels. When they return to the lower levels, the lose energy and this energy is released as light.

B. Procedure

1. Calculate the energy of the first 7 levels of the hydrogen atom using the following formula: $E_n = -R_H(1/n^2)$ where $R_H = 2.18 \times 10^{-18}$ J
2. Determine all of the possibilities of energy transitions for an electron to make if moving from a higher to a lower energy transition. For example, Level 7 to Level 6 is a possibility. Next, Level 7 to Level 5 is also an option. Continue to do this until all of the possibilities are exhausted..
3. Calculate the energies of each of these transitions by subtracting the energy of the lower level from that of the upper level. Tabulate these results for the 21 transitions.
4. Convert these energies to wavelength (λ), in meters, using the following formula: $\lambda = hc/E$ ($h = 6.63 \times 10^{-34}$ Js, $c = 3.0 \times 10^{8}$ m/s)
5. Convert these results to wavelength in nanometers.
6. Finally, identify which of these are in the visible spectrum and draw the final line spectrum.