# Stuff for Thursday, April 19, 2012

- NEXT WEEK: Guest lecturers! (I'm in Germany.)
- PS #6 and 1094 Session #4 are returned up front.
- Quiz #4 Friday on Q7 and Q8.

Spectral lines from transitions: $E_{\text{photon}} = hc/\lambda_{\text{photon}} = (E_i - E_f)_{\text{system}}$

1. Quanton in a box: $V(x) = 0$ for $0 \leq x \leq L$ and infinite outside.

$$E_n = \frac{h^2 n^2}{8mL^2} = \frac{(p_n c)^2}{2mc^2}\ , \quad p_n c = \frac{hc}{\lambda_n} = \frac{hc}{(2L/n)}\ , \ \lambda_{\text{photon}} = \frac{8mc^2L^2}{hc(n_i^2 - n_f^2)}$$

2. Harmonic oscillator: $V(x) = \frac{1}{2}k_s x^2 = \frac{1}{2}m\omega^2 x^2 \qquad (\omega = \sqrt{k_s/m})$

$$E_n = \frac{h\omega}{2\pi}(n + \frac{1}{2}) = \hbar\omega(n + \frac{1}{2})\ , \ n = 0, 1, 2, \ldots\ , \ \lambda_{\text{photon}} = \frac{1}{\hbar\omega}\frac{hc}{n_i - n_f}$$

3. Bohr model of hydrogen atom: circular orbit of radius $r$

$$E_n = -\frac{ke^2}{2a_0 n^2} = -\frac{13.6\ \text{ev}}{n^2}\ , \ r_n = n^2 a_0 = n^2\frac{(\hbar c)^2}{mc^2 ke^2}\ , \ \lambda_{\text{photon}} = \frac{2(hc)a_0}{ke^2}\frac{n_i^2 n_f^2}{n_i^2 - n_f^2}$$