

Stuff for Monday, April 16, 2012

- PS #6 due up front. Quiz #3 returned; class average: 8.2
 - Issues: energy eigenstates, $e^0 = 1 \neq 0$, complex conjugation
- Sm1094 session Wednesday. Quiz #4 Friday.
- Midterm poll: Conflicts for May 1 and May 2??

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

$$\psi_{E_n}(x) = \begin{cases} A \sin \frac{n\pi x}{L} & \text{if } 0 \leq x \leq L \\ 0 & \text{outside} \end{cases} \quad E_n = \frac{\hbar^2 n^2}{8mL^2} = \frac{p_n^2}{2m}, \quad p_n = \frac{h}{\lambda_n} = \frac{h}{(2L/n)}$$

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

$$E_n = \frac{\hbar\omega}{2\pi} \left(n + \frac{1}{2}\right) = \hbar\omega \left(n + \frac{1}{2}\right), \quad n = 0, 1, 2, \dots \text{ (cf. quanton in box: } n = 1, 2, 3, \dots \text{)}$$

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

$$E_n = -\frac{ke^2}{2a_0 n^2} = -\frac{13.6 \text{ eV}}{n^2} \quad a_0 = 0.053 \text{ nm (Bohr radius), } r_n = n^2 a_0$$