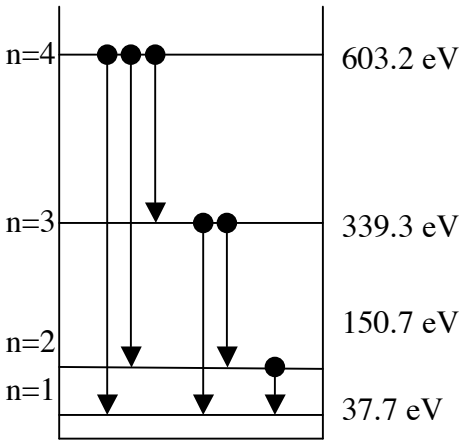
CHAPTER-6 HOMEWORK

#10- $E_n = n^2 \hbar^2\pi^2/2mL^2$ n = 1,2,3, L = 0.1nm

E1 = $\hbar^2\pi^2/2mL^2$ = (1.055 x 10^{-34} J-s) (9.87)/[2 (9.11x10^{-31} kg) (10^{-10} m)^2]
=6.029x10^{-18} J = 37.7 eV

E1 = 37.7 eV
E2 = 4 x E1 150.7 eV
E3 = 9 x E1 = 339.3 eV
E4 = 16 x E1 = 603.2 eV



	$\lambda = 1240/\Delta E$
ΔE_{41} = 565.5 eV	λ = 2.19 nm
ΔE_{42} = 452.5 eV	λ = 2.74 nm
ΔE_{43} = 263.9 eV	λ = 4.69 nm
ΔE_{31} = 301.6 eV	λ = 4.11 nm
ΔE_{32} = 188.6 eV	λ = 6.57 nm
ΔE_{21} = 113.0 eV	λ = 10.9 nm

#13- $E_n = n^2 \hbar^2\pi^2/2mL^2$ L = 0.2 nm

(a) $E_1 = \hbar^2/8\ m_p L^2$ = **5.13 x 10^{-3} eV**
(b) $E_1 = \hbar^2/8\ m_e L^2$ = **9.4 eV**
The proton is 1840 more massive thus moving with 1/1840 the energy!

#37- $\Psi = C(\psi 1 + \psi 2)$ where $|\psi 1|^2 = |\psi 2|^2 = 1$ *superposition*

(a) $|\Psi|^2 = C^2(|\psi 1|^2 + |\psi 2|^2) = 1 \rightarrow C = 1/\sqrt{2}$

(b) $\Psi(x,t) = 1/\sqrt{2}\{\psi 1\, e^{-i\omega 1\, t} + \psi 2\, e^{-i\omega 2\, t}\}$ $\omega 1 = E_1/\hbar$ $\omega 2 = E_2/\hbar$

(c) $\Psi = 1/\sqrt{2}\ \psi 1 + 1/\sqrt{2}\ \psi 2$

P1 = $|\ 1/\sqrt{2}\ |^2 = ½$ and P2 = $|\ 1/\sqrt{2}\ |^2 = ½$

<E> = p1 E1 + p2 E2 = ½ (E1 + E2)