Physics 211- Exam II – Fall 2009

FORMULAE

$KE = \frac{p^2}{2m} = \frac{1}{2}mv^2 = \frac{\hbar^2 k^2}{2m}$ $\quad E = KE + U$

$\lambda' - \lambda = \Delta\lambda = \frac{h}{mc}(1-\cos\theta)$ $\quad \frac{h}{mc} = .00243\text{ nm}$ $\quad K_{max} = hf - \phi$

$E_n = -\frac{13.6\text{eV}}{n^2} = -\left(\frac{mk_c^2 e^4}{2\hbar^2}\right)\frac{1}{n^2}$ $\quad k_c = \frac{1}{4\pi\varepsilon_0}$

$r_n = n^2 a_B$ $\quad a_B = \frac{\hbar^2}{mk_c e^2} = .053\text{ nm}$ $\quad L_n = n\hbar$

$\Delta E = hf = hc/\lambda$

$p = \frac{h}{\lambda} = \hbar k$ $\quad E = hf = \hbar\omega$ $\quad \Delta x\,\Delta p \geq \hbar/2$ $\quad \Delta E\,\Delta t \geq \hbar$

$-\frac{\hbar^2}{2m}\frac{d^2\psi(x)}{dx^2} + U(x)\,\psi(x) = E\,\psi(x)$

$< x > = \int \psi_{(x)} x \psi_{(x)} dx$ $\quad E_n = (n+1/2)\,\hbar\omega_o$ $\quad \omega_o = \sqrt{\frac{k_s}{m}}$

$\psi_n = \sqrt{\frac{2}{L}}\sin\frac{n\pi x}{L}$ $\quad E_n = n^2\frac{\hbar^2\pi^2}{2mL^2}$ $\quad \psi(x) \sim e^{-\alpha x}$ $\quad \alpha = \sqrt{2m(U_o - E)}/\hbar$

$\Psi(x,t) = \psi(x)\,e^{-i\omega t}$ $\quad |\psi(x)|^2 dx = \text{probability}$

$hc = 1240\text{ eV nm}$ $\quad \hbar c = 197.3\text{ eV nm}$ $\quad \hbar = h/2\pi$

$h = 6.6 \times 10^{-34}\text{ J} = 4.14 \times 10^{-15}\text{ eV-s}$

$c = 3 \times 10^{8}\text{ m/s}$ $\quad 1\text{ eV} = 1.6 \times 10^{-19}\text{J}$

$m_p = 1.67 \times 10^{-27}\text{ kg}$ $\quad m_e c^2 = .511\text{ MeV}$

$m_e = 9.1 \times 10^{-31}\text{ kg}$ $\quad m_p c^2 = 938\text{ MeV}$