USEFUL CONSTANTS and FORMULAS

$1\text{mW} = 10^{-3}\text{W} = 10^{-3}\text{ J s}^{-1}$ $1\text{nm} = 10^{-9}\text{m}$ $1\text{eV} = 1.602 \times 10^{-19}\text{ J}$

$h = 6.63 \times 10^{-34}\text{ J s}$ $\hbar = 1.05 \times 10^{-34}\text{ J s}$ $c = 3.0 \times 10^{8}\text{ m s}^{-1}$

$hc = 2.0 \times 10^{-25}\text{ J m}$ $m_e = 9.11 \times 10^{-31}\text{ kg}$ $e = 1.602 \times 10^{-19}\text{ C}$

$\lambda\nu = c$ $\varepsilon_0 = 8.854 \times 10^{-12}\, Cs^2 kg^{-1} m^{-3}$ $E = h\nu$ $\lambda = h/p$

$l_n = mrv = n$_ $r_n = n^2 a_0$ $a_0 = 5.29 \times 10^{-11}\text{ m}$

$$E_n = -\frac{1}{n^2}\frac{Z^2 me^4}{8\varepsilon_0^2 h^2} = -\frac{1}{n^2}\left(2.18x10^{-18}\text{ J}\right)$$

$$R = \frac{me^4}{8\varepsilon_0^2 h^3 c} = 109{,}678\text{ cm}^{-1}$$

$$E = \frac{\hbar^2 k^2}{2m} \qquad k = \frac{2\pi}{\lambda} \qquad \psi(x) = A\cos(kx) + B\sin(kx)$$

$$E_n = \frac{n^2 h^2}{8ma^2} \qquad \psi(0 \le x \le a) = \left(\frac{2}{a}\right)^{1/2}\sin\left(\frac{n\pi x}{a}\right)$$

$\Delta x \Delta p \geq$ _/2

for Particle in Box of length "a", for x=0 to x=a, $< x^2 >= \frac{a^2}{4}\left[\frac{4}{3} - \frac{2}{(n\pi)^2}\right]$, $< x >= \frac{a}{2}$

$$\hat{x} = x \qquad \hat{p} = \frac{\hbar}{i}\frac{d}{dx} \qquad \hat{l}_z = \frac{\hbar}{i}\frac{d}{d\phi}$$

$$e^{\pm i\theta} = \cos\theta \pm i\sin\theta \qquad \int \cos x\, dx = \sin x \qquad \int \sin x\, dx = -\cos x$$

$$\int \sin^2 y\, dy = \frac{1}{2}y - \frac{1}{4}\sin(2y) \qquad \int \cos^2 y\, dy = \frac{1}{2}y + \frac{1}{4}\cos(2y)$$

$$\int_0^\infty e^{-ax} dx = \frac{1}{a} \quad [a > 0] \qquad \int_0^\infty x^n e^{-ax}\, dx = \frac{n!}{a^{n+1}} \quad [n \text{ positive integer}, a > 0]$$