Physics 314 – Midterm test, formula sheet

$$c = 3 \times 10^8 \text{ m/s} \qquad h = 6.626 \times 10^{-34} \text{ J} \cdot \text{s} = 4.136 \times 10^{-15} \text{ eV} \cdot \text{s}$$

$$\hbar \equiv \frac{h}{2\pi} = 1.0546 \times 10^{-34} \text{ J} \cdot \text{s} = 6.582 \times 10^{-16} \text{ eV} \cdot \text{s}$$

$$1 \text{ eV} = 1.60218 \times 10^{-19} \text{ J} \qquad \text{m}_\text{e} = 9.1094 \times 10^{-31} \text{ kg} = 0.511 \text{ MeV/c}^2$$

$$\Delta t = \frac{\Delta t_0}{\sqrt{1 - u^2/c^2}} \qquad L = L_0\sqrt{1 - u^2/c^2} \qquad v = \frac{v' + u}{1 + v'u/c^2}$$

$$\mathbf{p} = \frac{m\mathbf{v}}{\sqrt{1 - v^2/c^2}}$$

$$K = \frac{mc^2}{\sqrt{1 - v^2/c^2}} - mc^2 \qquad K = E - E_0 \qquad E = \frac{mc^2}{\sqrt{1 - v^2/c^2}} \qquad E_0 = mc^2$$

$$E = \sqrt{(pc)^2 + (mc^2)^2}$$

$$2d \sin\theta = n\lambda \qquad n = 1, 2, 3 \ldots$$

$$E = h\nu \qquad \nu = \frac{c}{\lambda} \qquad p = \frac{h}{\lambda}$$

$$K_\text{max} = h\nu - \phi \qquad K_\text{max} = eV_\text{s}$$

$$I = \sigma T^4 \qquad \sigma = 5.6704 \times 10^{-8} \text{ W/m}^2 \cdot \text{K}^4 \qquad \lambda_\text{max} T = 2.898 \times 10^{-3} \text{ m} \cdot \text{K}$$

$$R(\lambda) = \left(\frac{c}{4}\right)\left(\frac{8\pi}{\lambda^4}\right)\left[\left(\frac{hc}{\lambda}\right)\frac{1}{e^{hc/\lambda kT} - 1}\right]$$

$$E + m_\text{e}c^2 = E' + E_\text{e} \qquad \frac{1}{E'} - \frac{1}{E} = \frac{1}{m_\text{e}c^2}(1 - \cos\theta) \qquad \lambda' - \lambda = \frac{h}{m_\text{e}c}(1 - \cos\theta)$$

$$\lambda = \frac{h}{p} \qquad \Delta x \Delta p_x \sim \hbar \qquad \hbar \equiv \frac{h}{2\pi}$$

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

$$P(x)dx = |\psi(x)|^2 dx \qquad \int_{-\infty}^{\infty} |\psi(x)|^2 dx = 1$$

$$\psi_n(x) = \sqrt{\frac{2}{L}} \sin\left(\frac{n\pi x}{L}\right) \qquad (n = 1, 2, 3, \ldots) \qquad E_n = \frac{\hbar^2\pi^2 n^2}{2mL^2} = E_1 n^2$$

$$\psi(x, y) = \frac{2}{L} \sin\left(\frac{n_x \pi x}{L}\right) \sin\left(\frac{n_y \pi y}{L}\right) \qquad (n_x, n_y = 1, 2, 3, \ldots) \qquad E = \frac{\hbar^2\pi^2}{2mL^2}(n_x^2 + n_y^2)$$

$$\omega_0 = \sqrt{k/m} \qquad E_n = (n + \frac{1}{2})\hbar\omega_0 \qquad (n = 0, 1, 2, 3, \ldots)$$