

PHY114 – Summer 2009 – Midterm 3

LIST OF POSSIBLY USEFUL FORMULAS

$$c = 3 \times 10^8 \text{ m/s}$$

$$\mu_0 = 4\pi \times 10^{-7} \text{ T.m/A}$$

$$\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2 / \text{Nm}^2$$

$$c = \frac{1}{\sqrt{\mu_0 \epsilon_0}}$$

$$k = \frac{2\pi}{\lambda}$$

$$\omega = 2\pi f$$

$$\lambda f = c$$

$$\frac{E}{B} = \frac{E_{\max}}{B_{\max}} = c$$

$$\mathbf{S} = \frac{1}{\mu_0} \mathbf{E} \times \mathbf{B}$$

$$I = \frac{E_{\max} B_{\max}}{2\mu_0} = \frac{P_{av}}{\text{Area}}$$

$$u_E = \frac{1}{2} \epsilon_0 E^2$$

$$u_B = \frac{B^2}{2\mu_0}$$

$$u = u_E + u_B = \epsilon_0 E^2 = \frac{B^2}{\mu_0}$$

$$u_{av} = \frac{1}{2} \epsilon_0 E_{\max}^2 = \frac{B_{\max}^2}{2\mu_0} = \frac{I}{c}$$

$$\boxed{p = \frac{U}{c}} \\ \boxed{P = \frac{S}{c}}$$

or

$$\boxed{p = \frac{2U}{c}} \\ \boxed{P = \frac{2S}{c}}$$

$$P = \frac{F}{A}$$

$$\theta_i = \theta_{\text{refl}}$$

$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$n = \frac{c}{v}$$

$$\lambda_n = \frac{\lambda}{n}$$

$$\sin \theta_c = \frac{n_2}{n_1}$$

$$M \equiv \frac{h'}{h}$$

$$\frac{n_1}{p} + \frac{n_2}{q} = \frac{n_2 - n_1}{R}$$

$$\frac{1}{p} + \frac{1}{q} = \frac{1}{f}$$

$$M = -\frac{q}{p}$$

$$f = \frac{R}{2} \text{ or } \frac{1}{f} = (n-1) \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$$

f - number = $f/\# = f/D$ for a camera

$$m_\theta \approx \frac{25\text{cm}}{f} \text{ for a magnifier}$$

$$M = -\frac{L}{f_{ob}} \frac{25\text{cm}}{f_{ey}} \text{ for a microscope}$$