PHY114 – Summer 2009 – Final

LIST OF POSSIBLY USEFUL FORMULAS

$\varepsilon_0 = 8.85 \times 10^{-12} C^2 / N.m^2$
$k_e = 8.99 \times 10^9 N.m^2 / C^2$
$e = -1.6 \times 10^{-19} C$

$$\oint \vec{\mathbf{E}} \cdot d\vec{\mathbf{A}} = \frac{q_{in}}{\varepsilon_0}$$
$$\oint \vec{\mathbf{B}}.d\vec{\mathbf{A}} = 0$$
$$\oint \vec{\mathbf{E}}.d\vec{\mathbf{s}} = -\frac{d\Phi_B}{dt}$$
$$\oint \vec{\mathbf{B}}.d\mathbf{s} = \mu_0 I + \mu_0 \varepsilon_0 \frac{d\Phi_E}{dt}$$
$$\vec{\mathbf{F}} = q\vec{\mathbf{v}} \times \vec{\mathbf{B}} + q\vec{\mathbf{E}}$$

$$\Phi_E = \int \vec{\mathbf{E}}.d\vec{\mathbf{A}}$$
$$\Delta V = -\int_i^f \vec{\mathbf{E}} \cdot d\vec{\mathbf{s}}$$
$$C = \frac{Q}{\Delta V}$$
$$C = \varepsilon_0 \frac{A}{d}$$
$$C = \kappa C_0$$
$$U = \frac{Q^2}{2C}$$
$$I = \frac{dq}{dt}$$
$$R = \frac{V}{I}$$
$$r = \frac{mv}{qB}$$
$$\vec{\mathbf{F}} = I\vec{\mathbf{L}} \times \vec{\mathbf{B}}$$
$$\vec{\boldsymbol{\tau}} = I\vec{\mathbf{A}} \times \vec{\mathbf{B}}$$
$B = \frac{\mu_0 I}{2\pi r}$ for a long, straight wire

$B = \frac{\mu_0 I \phi}{4\pi r}$ for a circular arc of wire

$m_e = 9.11 \times 10^{-31} kg$
$\mu_0 = 4\pi \times 10^{-7} T.m/A$
$c = 3 \times 10^8 m/s$

$B = \mu_0 nI$ for a solenoid

$B = \frac{\mu_0 NI}{2\pi r}$ for a toroid

$$\Phi_B = \int \vec{\mathbf{B}}.d\vec{\mathbf{A}}$$
$$\mathcal{E} = -N \frac{d\Phi_B}{dt}$$
$$c = \frac{1}{\sqrt{\mu_0 \varepsilon_0}}$$
$$k = \frac{2\pi}{\lambda}$$
$$\omega = 2\pi f$$
$$\lambda f = c$$
$$\frac{E}{B} = \frac{E_{\max}}{B_{\max}} = c$$
$$\vec{\mathbf{S}} = \frac{1}{\mu_0} \vec{\mathbf{E}} \times \vec{\mathbf{B}}$$
$$\theta_i = \theta_{refl}$$
$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$
$$n = \frac{c}{v}$$
$$\lambda_n = \frac{\lambda}{n}$$
$$\sin\theta_c = \frac{n_2}{n_1}$$
$$M \equiv \frac{h'}{h} = -\frac{q}{p}$$
$$\frac{1}{p} + \frac{1}{q} = \frac{1}{f}$$
$$f = \frac{R}{2} \text{ or } \frac{1}{f} = (n-1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

$$\phi = \frac{2\pi}{\lambda}\delta$$

$$\delta = d\sin\theta$$

$$\delta_{bright} = m\lambda$$

$$\delta_{dark} = \left(m + \frac{1}{2}\right)\lambda$$

$$y_{bright} = \frac{\lambda L}{d}m \quad , \; m = 0, \pm1, \pm2, \ldots$$

$$y_{dark} = \frac{\lambda L}{d}\left(\frac{1}{2} + m\right)$$

$$I = I_{\max}\cos^2\left(\frac{\phi}{2}\right)$$

$$\delta = 2nt$$

$$\delta = \lambda m \text{ or } \delta = \left(m + \frac{1}{2}\right)\lambda \, , \; m = 0, 1, 2, \ldots$$

$$\sin\theta = \frac{m\lambda}{a}$$

$$y_m \approx \frac{L}{a}\lambda m \quad m = \pm1, \pm2, \pm3, \ldots$$

$$I = I_{\max}\left[\frac{\sin(\pi a\sin\theta/\lambda)}{\pi a\sin\theta/\lambda}\right]^2$$

$$\theta_{\min} = \frac{\lambda}{a}$$

$$\theta_{\min} = 1.22\frac{\lambda}{D}$$

$$d\sin\theta = m\lambda$$

$$I = \frac{I_0}{2} \text{ or } I = I_0\cos^2\theta$$

$$n = \tan\theta_p$$