PHY2054.002 Fall 2010
Final Exam Formula

$F = k\frac{q_1 q_2}{r^2}$ $V = k\frac{q}{r}$ $E = k\frac{q}{r^2}$ $E = -\frac{\Delta V}{\Delta s}$

$q = CV$ $\kappa = \frac{E_o}{E}$ $Energy = \frac{1}{2}qV = \frac{q^2}{2C}$ $I = \frac{\Delta q}{\Delta t}$

$P = I^2 R = \frac{V^2}{R}$ $F = ma$

Resistor in parallel $\frac{1}{R_{parallel}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + ...$

Capacitor in series $\frac{1}{C_{series}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + ...$

Lorenz force $\vec{F} = q\vec{V} \times \vec{B}$, in scalar form, $F = qvB\sin\theta$

Centripetal force $F_c = \frac{mv^2}{r}$, charge moving in B field, $r = \frac{mv}{qB}$

$m = \left(\frac{er^2}{2V}\right)B^2$ Force on a current in B field $F = ILB\sin\theta$

A long straight wire $B = \frac{\mu_o I}{2\pi r}$, A loop of wire $B = \frac{\mu_o I}{2R}$

A solenoid B=μ_onI Ampere's law $\Sigma B_{11}\Delta\ell = \mu_o I$

$\tau = NIAB\sin\phi$ $\varepsilon = vBL$ $\varepsilon = -\frac{\Delta\Phi}{\Delta t}$ $\Phi = BA\cos\phi$

$\varepsilon = BLv_\perp$ $\omega = 2\pi f$ $\varepsilon = NAB\omega\sin\omega t$ $I = \frac{V-\varepsilon}{R}$

Mutual inductance $\varepsilon_S = -M\frac{\Delta I_P}{\Delta t}$ Self inductance $\varepsilon = -L\frac{\Delta I}{\Delta t}$

$Energy = \frac{1}{2}LI^2$ $Energy\ density = \frac{1}{2\mu_o}B^2$ $\frac{V_S}{V_P} = \frac{N_S}{N_P} = \frac{I_P}{I_S}$

$V_{rms} = I_{rms}X_C$ $X_C = \frac{1}{2\pi fC}$ $V_{rms} = I_{rms}X_L$ $X_L = 2\pi fL$

For RLC circuit $V_{rms} = I_{rms}Z$ $Z = \sqrt{R^2 + (X_L - X_C)^2}$

$\tan\phi = \frac{X_L - X_C}{R}$ $\overline{P} = I_{rms}V_{rms}\cos\phi = I_{rms}^2 Z\cos\phi$ $f_o = \frac{1}{2\pi\sqrt{LC}}$

$c = \frac{1}{\sqrt{\varepsilon_o\mu_o}}$ $\mu_o = 4\pi x10^{-7}$ Tm/A, $\varepsilon_o = 8.85x10^{-12}$ $C^2/(Nm^2)$

Electric energy density = $\frac{1}{2}\varepsilon_o E^2$, magnetic energy density = $\frac{1}{2\mu_o}B^2$, E=cB

Total energy density = $\frac{1}{2}\varepsilon_o E^2 + \frac{1}{2\mu_o}B^2$, $E_{rms} = \frac{1}{\sqrt{2}}E_o$, and $B_{rms} = \frac{1}{\sqrt{2}}B_o$

S= cu, $S = c\varepsilon_o E^2$, $S = (c/\mu_o)B^2$, $c = f\lambda$

$f_o = f_s(1 \pm \frac{v_{rel}}{c})$, $\overline{S} = \overline{S_o}\cos^2\theta$, $f = \frac{R}{2}$

Mirror equation. , $\frac{1}{d_o} + \frac{1}{d_i} = \frac{1}{f}$, $m = -\frac{d_i}{d_o}$

Snell's law $n_1 \sin\theta_1 = n_2 \sin\theta_2$

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

Brewster's angle $\tan\theta_B = \frac{n_2}{n_1}$

Thin lens equation $\frac{1}{d_o} + \frac{1}{d_i} = \frac{1}{f}$

Magnification equation, $m = -\frac{d_i}{d_o}$

Refractive power of a lens (in diopter) = 1/f (in meter)

Angular size = θ (in radians) ≈ h_o/d_o

Young's double slit experiment

Bright fringes ------- path difference = $d\cdot\sin\theta = m\lambda$ m=0, 1, 2, 3, ..

Dark fringes -------- path difference = $d\cdot\sin\theta = (m + ½)\cdot\lambda$, m = 0, 1, 2, 3, …

Thin film interference

Bright fringes ------ path difference = $2t + ½\lambda_{film} = m\lambda_{film}$

Dark fringes ------ path difference = $2t + ½\lambda_{film} = (m + ½)\lambda_{film}$,