Physics 202 Formula Sheet for Young&Geller Chapters 22--25 (Exam 3)

Chapter 22

$\varepsilon_0 = 8.854\times10^{-12}\ \mathrm{C^2/N\cdot m^2}$ $\mu_0 = 4\pi\times10^{-7}\ \mathrm{T\cdot m/A}$ $I_{\mathrm{rms}} = I/\sqrt{2}$ $V_{\mathrm{rms}} = V/\sqrt{2}$

$V_R = IR$ $X_L = \omega L$ $V_L = IX_L$ $X_C = \dfrac{1}{\omega C}$ $V_C = IX_C$ $\omega = 2\pi f$

$Z = \sqrt{R^2 + (X_L - X_C)^2}$ $V = IZ$ $\tan\phi = \dfrac{X_L - X_C}{R}$

$P = \frac{1}{2}VI\cos\phi = V_{\mathrm{rms}} I_{\mathrm{rms}}\cos\phi$ $\omega_0 = \dfrac{1}{\sqrt{LC}}$

Chapter 23

$E = cB$ $c = \dfrac{1}{\sqrt{\varepsilon_0\mu_0}} = 3.00\times10^8\ \mathrm{m/s}$ $c = f\lambda$ $k = \dfrac{2\pi}{\lambda}$ $\omega = 2\pi f$

$E = E_{\max}\sin(\omega t - kx)$ $B = B_{\max}\sin(\omega t - kx)$

$E = -E_{\max}\sin(\omega t + kx)$ $B = B_{\max}\sin(\omega t + kx)$

$u = \dfrac{1}{2}\varepsilon_0 E^2 + \dfrac{B^2}{2\mu_0} = \varepsilon_0 E^2$ $S = cu = \varepsilon_0 cE^2 = \dfrac{1}{\mu_0}EB$

$I = S_{\mathrm{av}} = \dfrac{1}{2}\varepsilon_0 cE_{\max}^2 = \dfrac{E_{\max}B_{\max}}{2\mu_0} = cu_{\mathrm{av}}$ $p = \dfrac{I}{c}$ (absorbing surface) $p = \dfrac{2I}{c}$ (reflecting surface)

$n = \dfrac{c}{v}$ $\lambda = \dfrac{\lambda_0}{n}$ $\theta_r = \theta_a$ $n_a\sin\theta_a = n_b\sin\theta_b$ $I = I_{\max}\cos^2\phi$ $\tan\theta_{\mathrm{p}} = \dfrac{n_b}{n_a}$

Chapter 24

spherical mirrors: $\dfrac{1}{s} + \dfrac{1}{s'} = \dfrac{1}{f}$ $f = R/2$ $m = -\dfrac{s'}{s}$

$\dfrac{n_a}{s} + \dfrac{n_b}{s'} = \dfrac{n_b - n_a}{R}$ $m = -\dfrac{n_a s'}{n_b s}$

thin lens: $\dfrac{1}{s} + \dfrac{1}{s'} = \dfrac{1}{f}$ $m = -\dfrac{s'}{s}$ $\dfrac{1}{f} = (n-1)\left(\dfrac{1}{R_1} - \dfrac{1}{R_2}\right)$

Chapter 25

f-number $= \dfrac{f}{D}$

$M = \dfrac{\theta'}{\theta} = \dfrac{25\ \mathrm{cm}}{f}$ (magnifier)

$M = \dfrac{(25\ \mathrm{cm})s_1'}{f_1 f_2}$ (microscope)

$M = -\dfrac{f_1}{f_2}$ (telescope)