

**PHYS 202      Spring 2002      Formula Sheet for Exam III**  
(Cutnell and Johnson Chapters 23–26)

$$\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/\text{N}\cdot\text{m}^2 \qquad \mu_0 = 4\pi \times 10^{-7} \text{ T}\cdot\text{m}/\text{A}$$

$$X_C = 1/(2\pi fC) \qquad X_L = 2\pi fL \qquad Z = \sqrt{R^2 + (X_L - X_C)^2} \qquad V_{\text{rms}} = I_{\text{rms}}Z$$

$$\tan \phi = (X_L - X_C)/R \qquad \bar{P} = I_{\text{rms}}V_{\text{rms}} \cos \phi$$

$$f_0 = 1/(2\pi\sqrt{LC})$$

$$v = f\lambda \qquad c = 3.00 \times 10^8 \text{ m/s} \qquad c = 1/\sqrt{\epsilon_0\mu_0}$$

$$\text{electric energy density} = \frac{1}{2}\epsilon_0 E^2 \qquad \text{magnetic energy density} = \frac{1}{2\mu_0} B^2$$

$$\bar{u} = \frac{1}{2}\epsilon_0 E_{\text{rms}}^2 + \frac{1}{2\mu_0} B_{\text{rms}}^2 = \epsilon_0 E_{\text{rms}}^2 = \frac{1}{\mu_0} B_{\text{rms}}^2 \qquad E = cB$$

$$\bar{S} = c\bar{u} \qquad \bar{S} = \bar{P}/A$$

$$f_o = f_s(1 \pm v_{\text{rel}}/c) \quad \text{if } v_{\text{rel}} \ll c$$

$$\text{Malus's law } \bar{S} = \bar{S}_0 \cos^2 \theta$$

$$\theta_r = \theta_i$$

$$\text{spherical mirrors: } \quad f = \pm R/2 \qquad 1/d_o + 1/d_i = 1/f \qquad m = -d_i/d_o$$

$$n = c/v \qquad n_1 \sin \theta_1 = n_2 \sin \theta_2 \qquad d' = d(n_2/n_1) \qquad \tan \theta_B = n_2/n_1$$

$$\text{thin lens: } \quad 1/d_o + 1/d_i = 1/f \qquad m = -d_i/d_o$$

$$M = \theta'/\theta$$

$$\text{magnifying glass } M = (1/f - 1/d_i)N$$

$$\text{compound microscope } M = -(L - f_e)N/(f_o f_e)$$

$$\text{telescope } M = -f_o/f_e$$