

# PHYSICS 2220

## Equation Sheet #4

$$1. I = \frac{E_m^2}{2\mu_0 c} \quad E_m = cB_m \quad \mu_0 = 4\pi \times 10^{-7} \text{ T}\cdot\text{m/A}$$

$$2. P_{\text{rad}} = \frac{I}{c} \text{ (abs)} \quad P_{\text{rad}} = \frac{2I}{c} \text{ (refl)} \quad P = \frac{F}{A}$$

$$3. I = I_0 \cos^2 \theta \quad \tan \theta_B = \frac{n_2}{n_1}$$

$$4. \text{ reflection: } \theta = \theta' \quad \text{refraction: } n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$n = \frac{c}{v} \quad f\lambda = c \quad n_1 \lambda_1 = n_2 \lambda_2 \quad \sin \theta_c = \frac{n_2}{n_1}$$

$$5. \frac{1}{f} = (n - 1) \left( \frac{1}{R_1} + \frac{1}{R_2} \right) \text{ (lenses)} \quad f = \frac{R}{2} \text{ (mirrors)}$$

$$6. \frac{1}{p} + \frac{1}{i} = \frac{1}{f} \quad m = \frac{h'}{h} = -\frac{i}{p}$$

$$7. \text{ double slits: } d \sin \theta = m\lambda \quad m = 0, 1, 2, 3, \dots \text{ (max); order} = m$$

$$d \sin \theta = (m + \frac{1}{2})\lambda \quad m = 0, 1, 2, 3, \dots \text{ (min); order} = m + 1 \quad \sin \theta = \frac{y}{D}$$

8. thin films with one phase shift:

$$2nL = (m + \frac{1}{2})\lambda \quad m = 0, 1, 2, 3, \dots \text{ (constructive)}$$

$$2nL = m\lambda \quad m = 0, 1, 2, 3, \dots \text{ (destructive)}$$

$$9. \text{ single slit: } a \sin \theta = m\lambda \quad m = 1, 2, 3, \dots \text{ (min); order} = m$$

$$10. \text{ for } \theta \text{ in radians: } \theta_{\text{min}} = \frac{\lambda}{a} \text{ (slit)} \quad \theta_{\text{min}} = \frac{1.22\lambda}{d} \text{ (circular)}$$

$$11. \text{ diffraction grating: } d \sin \theta = m\lambda \text{ (max)} \quad R = \frac{\lambda}{\Delta\lambda} = Nm$$

$$12. c = 3 \times 10^8 \text{ m/s} \quad s = r\theta$$

$$13. \text{ Circle: } C = 2\pi r \quad A = \pi r^2 \quad \text{Sphere: } A = 4\pi r^2 \quad V = \frac{4}{3}\pi r^3$$