PHYS 123 Exam 2 Equations

Chapter 18: $P = \dfrac{dF_{\text{fs}}^{\text{press}}}{dA}$, or, if uniform: $P = \dfrac{F_{\text{fs}}^{\text{press}}}{A}$ $\quad P(\text{at depth } d) = P_{\text{surf}} + \rho g d$

$P = P_{\text{gauge}} + P_{\text{atm}}$, $P_{\text{atm}} = 1.013 \times 10^5$ Pa at sea level $\quad 1 \text{ Pa} = 1 \text{ N/m}^2$

Buoyant force: $F_{\text{fo}}^{\text{b}} = \sum F_{\text{fo}}^{\text{press}} = \rho g V_{\text{disp}}$ $\quad$ Continuity: $\rho_1 A_1 v_1 = \rho_2 A_2 v_2$

Laminar flow rate: $Q = \dfrac{V}{\Delta t} = Av$ $\quad$ Bernoulli: $P_1 + \rho g y_1 + \frac{1}{2}\rho v_1^2 = P_2 + \rho g y_2 + \frac{1}{2}\rho v_2^2$

Chapter 30: Poynting vector in direction of $\vec{v}$: $\vec{S} = \dfrac{1}{\mu_0}\vec{E} \times \vec{B}$ $\quad I = \left|\vec{S}\right| \text{ W/m}^2$

Polarization (Malus): $I_{\text{out}} = I_{\text{in}} \cos^2\theta$

Chapter 33: index of refraction: $n = \dfrac{c_0}{c_{\text{material}}}$ $\quad \lambda_{\text{mat}} = \dfrac{\lambda}{n_{\text{mat}}}$ $\quad$ Snel: $n_1 \sin\theta_1 = n_2 \sin\theta_2$

Lens-mirror equ: $\dfrac{1}{f} = \dfrac{1}{o} + \dfrac{1}{i}$ $\quad$ Magnification: $M = \dfrac{h'}{h} = -\dfrac{i}{o}$ $\quad$ Angular: $M_\theta = \left|\dfrac{\theta_{\text{i}}}{\theta_{\text{o}}}\right|$

Lensmaker: $\dfrac{1}{f} = (n-1)\left(\dfrac{1}{R_1} + \dfrac{1}{R_2}\right)$ $\quad$ Mirror: $f = \dfrac{R}{2}$ $\quad$ Magnifying glass: $M_\theta \approx \dfrac{0.25 \text{ m}}{f}$

Cmpd. Microscope: $M = M_1 M_{\theta 2} = \dfrac{-0.25 \text{ m}}{f_2\left(\dfrac{o_1}{f_1} - 1\right)}$ $\quad$ Refr. Telescope: $M_\theta = \left|\dfrac{\theta_{\text{i}}}{\theta_{\text{o}}}\right| \approx \left|\dfrac{f_1}{f_2}\right|$

Chapter 34: Principle maxima multi-slits: $d \sin\theta = \pm m\lambda$, $m = 0, 1, 2, 3, ...$

Dark fringes multi-slits: $d \sin\theta_{\text{min}} = \pm \dfrac{k}{N}\lambda$, $k = 1, 2, ...$ not multiple of N

Thin film: $\phi = \dfrac{4\pi n_{\text{b}} t}{\lambda} + \phi_{\text{r2}} - \phi_{\text{r1}}$ $\quad$ Thin slit width a ,dark : $\quad a \sin\theta = \pm n\lambda$, $n = 1, 2, 3, ...$

Rayleigh: $\theta_{\text{r}} \approx 1.22\dfrac{\lambda}{D}$, $D =$ diameter $\quad$ light speed: $c_0 = 2.998 \times 10^8$ m/s

Energy: $1 \text{ eV} = 1.602 \times 10^{-19}$ J $\quad$ Planck: $h = 6.626 \times 10^{-34}$ J·s $\quad$ deBroglie: $\lambda = \dfrac{h}{p}$

Photoelectric: $E_{\text{photon}} = hf = K_{\text{max}}^{\text{elec}} + E_0$ $\quad$ Momentum: $p_{\text{photon}} = \dfrac{E}{c_0} = \dfrac{hf}{c_0}$