PHY 203

$$q = Ne$$

$$\vec{F} = k\frac{q_1 q_2}{r^2}\hat{r}$$

$$\vec{E} \equiv \frac{\vec{F}}{q}$$

$$\vec{E} = k\frac{q}{r^2}\hat{r}$$

$$\text{PE} = U = k\frac{q_1 q_2}{r}$$

$$\mathcal{V} \equiv \frac{U}{q} = \frac{-\text{W}}{q}$$

$$\mathcal{V} = k\frac{q}{r}$$

$$E_x = -\frac{\Delta\mathcal{V}(x)}{\Delta x}$$

$$\Phi_E = \vec{E}\cdot\vec{A} = A|\vec{E}|\cos\theta$$

$$\Phi_E = \frac{q_{\text{enclosed}}}{\epsilon_0}$$

$$C \equiv \frac{q}{\mathcal{V}}$$

$$C = \frac{\kappa\epsilon_0 A}{d}$$

$$\frac{1}{C_{\text{series}}} = \frac{1}{C_1} + \frac{1}{C_2} + \ldots$$

$$C_{\text{parallel}} = C_1 + C_2 + \ldots$$

$$U = \frac{1}{2}q\mathcal{V}$$

$$U = \frac{1}{2}\frac{q^2}{C}$$

$$U = \frac{1}{2}C\mathcal{V}^2$$

$$u = \frac{\epsilon_0}{2}|\vec{E}|^2$$

$$I = \frac{\Delta q}{\Delta t}$$

$$\vec{I} = nqA\vec{v}_{\text{drift}}$$

$$q\vec{v} = I\vec{\ell}$$

$$\mathcal{V} = IR$$

$$R = \frac{\rho\ell}{A}$$

$$\rho = \rho_0(1 + \alpha\Delta T)$$

$$R = R_0(1 + \alpha\Delta T)$$

$$P = I\mathcal{V}$$

$$P = \frac{\mathcal{V}^2}{R}$$

$$P = I^2 R$$

$$\mathcal{V}(t) = \mathcal{V}_0\sin(\omega t)$$

$$P_{\text{avg}} = \frac{1}{2}I_0\mathcal{V}_0$$

$$P_{\text{avg}} = I_{\text{RMS}}\mathcal{V}_{\text{RMS}}$$

$$R_{\text{series}} = R_1 + R_2 + \ldots$$

$$\frac{1}{R_{\text{parallel}}} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots$$

$$\tau = RC$$

$$I(t) = I_{\text{max}}e^{-t/\tau}$$

$$\mathcal{V}_R(t) = \mathcal{V}_{\text{battery}}e^{-t/\tau}$$

$$\mathcal{V}_C = \mathcal{V}_{\text{battery}}\left(1 - e^{-t/\tau}\right)$$

$$\mathcal{V}_R(t) = \mathcal{V}_{\text{max}}e^{-t/\tau}$$

$$\mathcal{V}_C = -\mathcal{V}_{\text{max}}e^{-t/\tau}$$

$$\vec{F}_B = q\vec{v}\times\vec{B}$$

$$F_B = qvB\sin\theta$$

$$F = I\ell B\sin\theta$$

$$\mu = NIA$$

$$\tau = \mu B\sin\theta$$

$$U = -\mu B\cos\theta$$

$$B = \frac{\mu_0 I}{2\pi r}$$

$$B = \frac{N\mu_0 I}{2r}$$

$$B = \frac{N\mu_0 I}{\ell} = n\mu_0 I$$

$$\frac{F}{\ell} = \frac{\mu_0 I_1 I_2}{2\pi r}$$

$$\Phi_B \equiv \vec{B}\cdot\vec{A} = BA\cos(\theta)$$

$$\text{EMF} = -\frac{\Delta\Phi_{\text{tot}}}{\Delta t} = -N\frac{\Delta\Phi_1}{\Delta t}$$

$$\text{EMF} = NAB\omega\sin(\omega t)$$

$$\frac{\mathcal{V}_{\text{S}}}{\mathcal{V}_{\text{P}}} = \frac{N_{\text{S}}}{N_{\text{P}}} = \frac{I_{\text{P}}}{I_{\text{S}}}$$

$$\text{EMF} = -L\frac{\Delta I}{\Delta t}$$

$$U = \frac{1}{2}LI^2$$

$$u = \frac{1}{2\mu_0}B^2$$

$$\tau = \frac{L}{R}$$

$$X_C = \frac{1}{2\pi fC} = \frac{1}{\omega C}$$

$$X_L = 2\pi fL = \omega L$$

$$I_{\text{RMS}} = \frac{\mathcal{V}_{\text{RMS}}}{|Z|}$$

$$|Z_{\text{total}}| = \sqrt{R^2 + (X_L - X_C)^2}$$

$$\tan\phi = \frac{X_L - X_C}{R}$$

$$\omega_{\text{res}} = 2\pi f_{\text{res}} = \frac{1}{\sqrt{LC}}$$

$$P_{\text{avg}} = I_{\text{RMS}}\mathcal{V}_{\text{RMS}}\cos\phi$$

$$|\vec{E}| = c|\vec{B}|$$

$$c = \frac{1}{\sqrt{\mu_0\epsilon_0}}$$

$$v = f\lambda$$

$$I_{\text{avg}} = \frac{|\vec{E}_{\text{max}}||\vec{B}_{\text{max}}|}{2\mu_0}$$

$$n \equiv \frac{c}{v}$$

$$n_1\sin(\theta_1) = n_2\sin(\theta_2)$$

$$\theta_c = \sin^{-1}\left(\frac{n_2}{n_1}\right)$$

$$P = \frac{1}{f} = \frac{1}{d_{\text{O}}} + \frac{1}{d_{\text{I}}}$$

$$\frac{1}{f} = \left(\frac{n_{\text{l}} - n_{\text{m}}}{n_{\text{m}}}\right)\left(\frac{1}{r_1} - \frac{1}{r_2}\right)$$

$$m \equiv \frac{h_{\text{I}}}{h_{\text{O}}} = -\frac{d_{\text{I}}}{d_{\text{O}}}$$

$$f = \frac{r}{2}$$

$$m = m_{\text{objective}}\, m_{\text{eyepiece}}$$

$$m \sim \left(\frac{\text{N.P.}}{f_{\text{e}}}\right)\left(\frac{\ell - f_{\text{e}}}{d_{\text{o}}}\right)$$

$$M = \frac{\theta_{\text{telescope}}}{\theta_{\text{naked eye}}} = -\frac{f_{\text{o}}}{f_{\text{e}}}$$

$$d\sin(\theta) = m\lambda$$

where $m \in \{0, \pm 1, \pm 2, \ldots\}$

$$d\sin(\theta) = \left(m - \frac{1}{2}\right)\lambda$$

where $m \in \{1, 2, \ldots\}$

$$2t = m\lambda$$

where $m \in \{0, 1, 2, \ldots\}$

$$2t = \left(m - \frac{1}{2}\right)\lambda$$

where $m \in \{1, 2, 3, \ldots\}$

$$\sin(\theta) = 1.22\frac{\lambda}{D}$$

$$E = \Delta mc^2$$

$$E = hf = pc$$

$$E = hf = \hbar\omega = \frac{hc}{\lambda}$$

$$(\Delta x)(\Delta p) \geq \frac{\hbar}{2}$$

$$(\Delta t)(\Delta E) \geq \frac{\hbar}{2}$$

$$r_n = \frac{n^2}{Z}a_{\text{B}}$$

$$n\lambda_n = \frac{nh}{m_{\text{e}}v_n} = 2\pi r_n$$

$$E_n = -\frac{Z^2}{n^2}(13.86\text{ eV})$$

$$\frac{1}{\lambda} = \left(\frac{1}{n_{\text{f}}^2} - \frac{1}{n_{\text{i}}^2}\right)\mathcal{R}$$

$$Q = (M_A + M_B - M_C - M_D)c^2$$

$$|\vec{L}| = m_{\text{e}}vr_n = n\hbar$$

$$N(t) = N_0 e^{-\lambda t} = N_0 2^{-t/t_{1/2}}$$

$$\lambda = \frac{\ln 2}{t_{1/2}}$$

$$R \equiv \frac{\Delta N}{\Delta t}$$

$$R = N\lambda = \frac{N\ln 2}{t_{1/2}}$$

$$r = r_{\text{nuc}}A^{1/3}$$

Hydrogen Spectrum Series

Lymann: $n_{\text{f}} = 1$

Balmer: $n_{\text{f}} = 2$

Paschen: $n_{\text{f}} = 3$