

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

$$k = \frac{1}{4\pi\epsilon_0}$$

$$\vec{E} = \frac{\vec{F}}{q_0}$$

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

$$E = \frac{\sigma}{\epsilon_0}$$

$$\Phi_E = \Sigma(E \cos \theta) \Delta A$$

$$\Phi_E = \frac{Q_{encl}}{\epsilon_0}$$

$$V = \frac{EPE}{q_0}$$

$$V_B - V_A = \frac{-W_{AB}}{q_0}$$

$$V = \frac{kq}{r}$$

$$E = -\frac{\Delta V}{\Delta s}$$

$$EPE = k \frac{q_1 q_2}{r}$$

$$q = CV$$

$$Energy = \frac{1}{2} CV^2$$

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

$$V = IR$$

$$P = IV = I^2 R = \frac{V^2}{R}$$

$$\omega = 2\pi f$$

$$R_{eq} = R_1 + R_2 + \dots$$

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \dots$$

$$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + \dots$$

$$C_{eq} = C_1 + C_2 + \dots$$

$$q = q_0(1 - e^{-t/(RC)})$$

$$q = q_0 e^{-t/(RC)}$$

$$\tau = RC$$

$$F = q(v \sin \theta)B$$

$$F = ILB \sin \theta$$

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

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

$$B = \mu_0 n I$$

$$n = N/L$$

$$\Sigma B_{||} \Delta l = \mu_0 I_{encl}$$

$$\mathcal{E} = BLv$$

$$\Phi_B = BA \cos \theta$$

$$\mathcal{E} = -N \frac{\Delta \Phi_B}{\Delta t}$$

$$\mathcal{E} = -L \frac{\Delta I}{\Delta t}$$

$$M = \frac{N_S \Phi_S}{I_P}$$

$$\mathcal{E} = -M \frac{\Delta I_P}{\Delta t}$$

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

$$X_C = \frac{1}{\omega C}$$

$$X_L = \omega L$$

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

$$V_{rms} = I_{rms} Z$$

$$V_{rms} = \frac{V}{\sqrt{2}}$$

$$f_0 = \frac{1}{2\pi\sqrt{LC}}$$

$$\bar{S} = \bar{S}_0 \cos^2 \theta$$

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

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

$$\frac{1}{d_o} + \frac{1}{d_i} = \frac{1}{f}$$

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

$$m = -\frac{d_i}{d_o}$$

$$|m| = \frac{h_i}{h_o}$$

$$M = m_1 m_2$$

$$\lambda_n = \frac{\lambda}{n}$$

$$N_2 - N_1 = \frac{L}{\lambda}(n_2 - n_1)$$

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

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

$$2L = \left(m + \frac{1}{2}\right) \frac{\lambda}{n_2}$$

$$2L = m \frac{\lambda}{n_2}$$

$$W \sin \theta = m\lambda$$

$$\Delta t = \frac{\Delta t_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$

$$L = L_0 \sqrt{1 - \frac{v^2}{c^2}}$$

$$p = \frac{mv}{\sqrt{1 - \frac{v^2}{c^2}}}$$

$$E = \frac{mc^2}{\sqrt{1 - \frac{v^2}{c^2}}}$$

$$E_0 = mc^2$$

$$E^2 = p^2 c^2 + m^2 c^4$$

$$E = hf$$

$$hf = KE_{max} + W_0$$

$$p = \frac{h}{\lambda}$$

$$\lambda' - \lambda = \frac{h}{mc}(1 - \cos \theta)$$

$$\lambda = \frac{h}{p}$$

$$(\Delta p_y)(\Delta y) \geq \frac{h}{4\pi}$$

$$(\Delta E)(\Delta t) \geq \frac{h}{4\pi}$$

.....other.....

$$F_{cp} = m \frac{v^2}{r}$$

$$KE = \frac{1}{2}mv^2$$

$$\omega = 2\pi f = \frac{2\pi}{T}$$

.....constants.....

$$g = 9.8 \text{ m/s}^2$$

$$k \approx 9 \times 10^9 \text{ N} \cdot \text{m}^2/\text{C}^2$$

$$e = 1.60 \times 10^{-19} \text{ C}$$

$$\mu_0 = 4\pi \times 10^{-7} \text{ Tm/A}$$

$$\epsilon_0 = 8.854 \times 10^{-12} \text{ C}^2/(\text{N} \cdot \text{m}^2)$$

$$c \approx 3 \times 10^8 \text{ m/s}$$

$$h = 6.63 \times 10^{-34} \text{ J} \cdot \text{s}$$

$$m_e = 9.11 \times 10^{-31} \text{ kg}$$

$$n_{air} = 1$$

$$n_{water} = 1.33$$