$$\vec{F} = m\vec{a} \qquad \vec{p} = m\vec{v} \qquad KE = \frac{1}{2}mv^2 = \frac{p^2}{2m} \qquad W_{tot} = \Delta(KE) = KE_f - KE_i$$

$$\mathbf{ma_{ucm} = \frac{mv^2}{R}}$$

$$k = 8.99\,(10)^9 \left[\frac{Nm^2}{C^2}\right] \qquad k = \frac{1}{4\pi\varepsilon_o}$$

$$\mathbf{A_{sphere\text{-}surface} = 4\pi\ r^2}$$

$$A_{circle} = \pi\ r^2$$

$$V_{sphere} = \frac{4}{3}\pi r^3$$

$$F = k\frac{q_1 q_2}{r^2} = \frac{1}{4\pi\varepsilon_o}\frac{q_1 q_2}{r^2}$$

$$\varepsilon_o = 8.85\,(10)^{-12}\left[\frac{C^2}{N\,m^2}\right] \qquad \mu_o = 4\,\pi\,(10)^{-7}\ Tm/A$$

$$E = \frac{F}{q} \qquad V = \frac{U}{q} \qquad E = k\frac{q}{r^2} = \frac{1}{4\pi\varepsilon_o}\frac{q}{r^2} \qquad V = k\frac{q}{r} = \frac{1}{4\pi\varepsilon_o}\frac{q}{r}$$

$$\sim e^{-t/\tau}$$

$$\tau = RC$$

$$\tau = L / R$$

$$\sum_{surf} \mathbf{E}_\perp\ \Delta\mathbf{A} = \frac{\mathbf{q_{inside}}}{\boldsymbol{\varepsilon_o}}$$

$$Q = VC \qquad C = \frac{A\varepsilon_o}{d} \qquad \sigma = \frac{Q}{A} \qquad \frac{QV}{2} = \frac{CV^2}{2} = \frac{Q^2}{2C}$$

$$V = Ed \qquad E = \frac{\sigma}{\varepsilon_o}$$

$$\frac{1}{C_{eff}} = \frac{1}{C_1} + \frac{1}{C_2} \qquad C_{eff} = C_1 + C_2$$

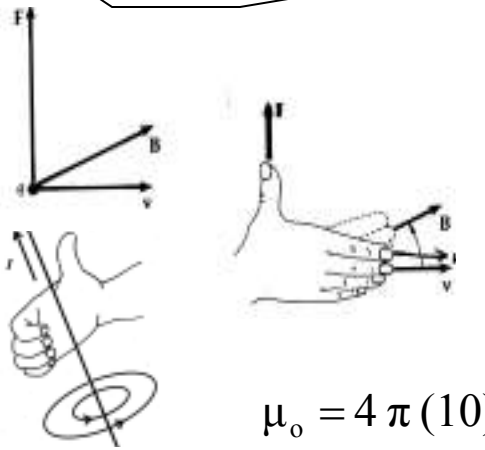
$$R_{eff} = R_1 + R_2 \qquad \frac{1}{R_{eff}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\sum_{junc} I_j = 0 \qquad V = I\,R \qquad P = I\,V = I^2\,R = \frac{V^2}{R}$$

$$\sum_{loop} V_j = 0$$

$$F = q\,v\,B_\perp = q\,v_\perp\,B = q\,v\,B\sin(\theta)$$

$$F = I\,L\,B_\perp = I_\perp\,L\,B = I\,L\,B\sin(\theta)$$



$$B = \frac{\mu_o I}{2\,\pi\,r}$$

$$\sum_{curv} B_{\parallel}\,\Delta l = \mu_o\ I_\perp$$

$$\mu_o = 4\,\pi\,(10)^{-7}\ Tm/A$$

$$\Phi = \sum B_{\perp} \Delta A$$

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

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

$$\omega_0 = 1/\sqrt{LC}$$

$$V = I Z$$

$$Z_C = X_C = 1/\omega C$$

$$Z_L = X_L = \omega L$$

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

$$E = mc^2 \qquad m = m_0 / \sqrt{1 - (v/c)^2}$$

$$\tau = \tau_0 / \sqrt{1 - v^2/c^2}$$

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

$$E = hf$$

$$hf = \varphi_0 + \frac{1}{2} m v^2$$

$$h = 6.63\,(10)^{-34}\ \text{Js}$$

$$c = \lambda f \qquad \Delta f / f = \pm v/c$$

$$c = 3 \times 10^8\ m/s = \frac{1}{\sqrt{\varepsilon_0 \mu_0}}$$

$$u = \frac{1}{2} \varepsilon_o E^2 + \frac{1}{2 \mu_o} B^2$$

$$\theta_i = \theta_r \qquad n = c/v$$

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

$$\frac{d}{2} \sin(\theta) = \ldots$$

$$d \sin(\theta) = \ldots$$

$$m = -\frac{i}{o}$$

$$\frac{1}{f} = \frac{1}{o} + \frac{1}{i}$$

$$E = -13.6 \frac{(Z^*)^2}{n^2}\ (\text{eV})$$

$${}^{A}_{Z}X$$

$$r = .53 \frac{n^2}{Z}\ (\text{Å})$$

$${}^{1}_{1}p \quad {}^{1}_{0}n \quad {}^{4}_{2}He \quad e^- \quad e^+$$

$$938\ \text{MeV} \qquad .511\ \text{MeV}$$

$$p = h/\lambda$$

$$E = \frac{p^2}{2m} + V(x)$$

$$\psi(x) \qquad |\psi(x)|^2$$

$$N = N_0 \left(\frac{1}{2}\right)^{t/T_{1/2}}$$

$$L = n \frac{\lambda}{2}$$

$$\Delta p\, \Delta x \geq h/2\pi$$

$$\Delta E\, \Delta t \geq h/2\pi$$

$$n = 1, 2, 3, \ldots$$

$$l = 0, 1, 2, \ldots$$

$$l = n - 1, n - 2, \ldots$$

$$m = -l, -l+1, \ldots, l-1, l$$

$$2l + 1$$