Possibly Useful Information

$F = \frac{1}{4\pi\varepsilon_0}\frac{|q_1||q_2|}{r^2}$

$\varepsilon_0 = 8.85 \text{ X } 10^{-12} (C^2 / N - m^2)$

$e = 1.6 \text{ X } 10^{-19}$ C, $m_e = 9.11 \text{ x } 10^{-31}$ Kg

$m_p = 1.67 \text{ x } 10^{-27}$ Kg

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

$E = \frac{|q|}{4\pi\varepsilon_0 r^2}$

$\varepsilon_0\Phi = \varepsilon_0\oint \vec{E}.d\vec{A} = q_{enc}$

$\Delta x = x_2 - x_1$, $\Delta t = t_2 - t_1$

$\bar{v} = \Delta x / \Delta t$

$\bar{s}$ = (total distance) / Δt

$v = dx/dt$

$\bar{a} = \Delta v / \Delta t$

$a = dv/dt = d^2x/dt^2$

$v = v_o + at$

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

$x - x_o = v_o t + (\frac{1}{2})at^2$

$\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$

$v^2 = v_o^2 + 2a(x - x_o)$

$\Delta\vec{r} = \vec{r}_2 - \vec{r}_1$

$x - x_o = \frac{1}{2}(v_o + v)t$

$\Delta\vec{r} = (x_2 - x_1)\hat{i} + (y_2 - y_1)\hat{j} + (z_2 - z_1)\hat{k}$

$x - x_o = vt - 1/2at^2$

$\bar{\vec{v}} = \Delta\vec{r} / \Delta t$, $\Delta\vec{r} = \vec{r}_2 - \vec{r}_1$

$\vec{a} = d\vec{v} / dt$

$\bar{\vec{a}} = \Delta\vec{v} / \Delta t$

$\Delta U = U_f - U_i = -W$

$\Delta V = V_f - V_i = -W/q_0 = \Delta U/q_0$

$U = -W_\infty$

$V = -W_\infty/q_0$

$V_f - V_i = -\int_i^f \vec{E}.d\vec{s}$

$V = -\int_i^f \vec{E}.d\vec{s}$

$V = \frac{1}{4\pi\varepsilon_0}\frac{q}{r}$

$V = \sum_{i=1}^{n} V_i = \frac{1}{4\pi\varepsilon_0}\sum_{i=1}^{n}\frac{q_i}{r_i}$

$E = \sigma/\varepsilon_0$

$V = \frac{1}{4\pi\varepsilon_0}\int\frac{dq}{r}$

$E_s = \frac{\partial V}{\partial s}$

$E_x = \frac{\partial V}{\partial x}; E_y = \frac{\partial V}{\partial y}; E_z = \frac{\partial V}{\partial z}$

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

$U = -W = \frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{r_{12}}$

$Q = CV$

$C = \frac{\varepsilon_0 A}{d}$

$C = 2\pi\varepsilon_0 \frac{l}{\ln(b/a)}$

$C = 4\pi\varepsilon_0 \frac{ab}{b-a}$

$C = 4\pi\varepsilon_0 R$

$C_{eq} = \sum C_j$ (parallel)

$\frac{1}{C_{eq}} = \sum\frac{1}{C_j}$ (series)

$U = \frac{Q^2}{2C} = \frac{1}{2}CV^2$

$u = \frac{1}{2}\varepsilon_0 E^2$

$C = \kappa C_0$

$I = dQ/dt$

$\rho = 1/\sigma$

$R = \rho L / A$

$P = IV$

$P_{emf} = I\varepsilon$

$\frac{1}{R_{eq}} = \sum \frac{1}{R_j}$ (parallel)

$I = (\varepsilon/R)e^{-t/RC}$

$I = (Q/RC)e^{-t/RC}$, $I_0 = (Q/RC)$

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

$d\vec{F} = Id\vec{s} \times \vec{B}$

$\vec{\mu} = NI\vec{A}$

$B = \mu_0 I/2\pi r$

$F/l = (\mu_0 I_1 I_2)/2\pi a$

$I_d = \varepsilon_0 d\Phi_E / dt$

$L = N\Phi / I$

$\varepsilon = -L\, dI/dt$

$I = I_0 e^{-t/\tau}$

$\mu_B = B^2/(2\mu_0)$

$E = E_{max}\cos(kx-\omega t)$

$I = E_{max}^2/(2c\mu_0) = S_{av}$

$P = S/c$

$n = c/v$

$I = ½ I_0$, $I = I_0 \cos^2(\theta)$

$\theta_c = \sin^{-1}(n_2/n_1)$

$1/f = 1/p + 1/q = 2/R$

$1/f = (n-1)(1/R_1 - 1/R_2)$

$n = \lambda_0/\lambda$

$\text{Sin}(\theta) = y/L$

$2nt = (m + 1/2)\lambda$, $2nt = m\lambda$,

$V = IR$

$P = I^2R = V^2/R$

$I = \varepsilon/(R+r)$

$R_{eq} = \sum R_j$ (series)

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

$q(t) = Qe^{t/RC}$

$\vec{F} = I\vec{L} \times \vec{B}$

$\tau = \vec{\mu} \times \vec{B}$

$d\vec{B} = \frac{\mu_0}{4\pi} \frac{Id\vec{s} \times \vec{r}}{r^3}$, $\mu_0 = 4\pi \times 10^{-7}$ T·m/A

$B = \mu_0 nI$ (solenoid)

$\oint \vec{B}.d\vec{s} = \mu_0 I_{enc}$

$B = (\mu_0 IN)/(2\pi r)$ (toroid)

$\Phi_B = \int \vec{B}.d\vec{A}$

$\varepsilon = \oint \vec{E}.d\vec{s} = -N\, d\Phi_B/dt$

$L = \mu_0 n^2 A l$

$I = (\varepsilon/R)(1-e^{-t/\tau})$, $\tau = L/R$

$U_B = (1/2)LI^2$

$c = \omega/k = E/B = 1/(\mu_0\varepsilon_0)^{1/2} = 3.0 \times 10^8$ m/s $= \lambda f$, $\omega = 2\pi f$

$\vec{S} = \frac{1}{\mu_0} \vec{E} \times \vec{B}$

$I = P_s/4\pi r^2$

$p_r = I/c$, $p_r = 2I/c$

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

$n_1/p + n_2/q = (n_2 - n_1)/R$

$M = -q/p$, $|M| = h'/h$

$\beta = 2\pi a\sin(\theta)/\lambda$

$d\sin(\theta) = m\lambda$, $d\sin(\theta) = (m+1/2)\lambda$

$I = I_{max}\cos^2(\phi/2)\sin^2(\beta/2)/(\beta/2)^2$

$\delta/\phi = \lambda/2\pi$

$E = hf$

$\lambda' - \lambda_0 = (h/m_e c)(1-\cos(\theta))$

$eVs = Kmax = hf - \phi$

$\Delta x \cdot \Delta p_x \geq h/2\pi$, $\Delta y \cdot \Delta p_y \geq h/2\pi$, $\Delta z \cdot \Delta p_z \geq h/2\pi$

$\lambda = h/p$

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

$I = I_{max}\cos^2(\phi/2) = I_{max}\cos^2(\pi d\sin(\theta)/\lambda)$

$p = hf/c = h/\lambda$

$\lambda = h/p$

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

$n = \tan(\theta_p)$

$$E_n = -13.6n^2$$

$hc = 1240$ eV$\cdot$ nm