$$e = 1.602 \times 10^{-19} C.$$
$$m_e = 9.109 \times 10^{-31} kg$$
$$m_p = 1.673 \times 10^{-27} kg$$
$$c = 2.998 \times 10^8 \, m/s$$
$$v = v_0 + at$$
$$x - x_0 = v_0 t + \frac{1}{2}at^2$$
$$v^2 = v_0^2 + 2a(x - x_0)$$

$$k = \frac{1}{4\pi\varepsilon_0} = 8.99 \times 10^9 N \cdot m^2/C^2$$
$$\varepsilon_0 = 8.85 \times 10^{-12} \, C^2/(N \cdot m^2)$$
$$\varepsilon_0 = 8.85 \times 10^{-12} \, F/m$$
$$\mu_0 = 4\pi \times 10^{-7} T \cdot m/A \approx 1.26 \times 10^{-6} T \cdot m/A$$

10^{24} yotta Y	10^{-1} deci d
10^{21} zetta Z	10^{-2} centi c
10^{18} exa E	10^{-3} milli m
10^{15} peta P	10^{-6} micro μ
10^{12} tera T	10^{-9} nano n
10^{9} giga G	10^{-12} pico p
10^{6} mega M	10^{-15} femto f
10^{3} kilo k	10^{-18} atto a
10^{2} hecto h	10^{-21} zepto Z
10^{1} deka da	10^{-24} yocto y

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

$$\lambda = \frac{Q}{L}$$
$$\sigma = \frac{Q}{A}$$
$$\rho = \frac{Q}{V}$$

$$dq = \lambda ds$$
$$dq = \sigma dA$$
$$dq = \rho dV$$

$$p = qd$$
$$\vec{\tau} = \vec{p} \times \vec{E}$$
$$U = -\vec{p} \cdot \vec{E}$$

$$\vec{E} = \frac{\vec{F}}{q_0} = \frac{1}{4\pi\varepsilon_0}\frac{q}{r^2}\hat{r}$$
$$E = \int \frac{1}{4\pi\varepsilon_0}\frac{dq}{r^2}$$

$$E = \frac{1}{2\pi\varepsilon_0}\frac{p}{z^3}$$
$$E_s = -\frac{\partial V}{\partial s}$$

$$W = -\Delta U = -(U_f - U_i)$$
$$\Delta V = V_f - V_i = -\frac{W}{q}$$
$$V_f - V_i = -\int_i^f \vec{E} \cdot d\vec{s}$$

$$E = \frac{qz}{4\pi\varepsilon_0(z^2 + R^2)^{3/2}}$$
$$K_i + U_i = K_f + U_f$$

$$E = \frac{\sigma}{2\varepsilon_0}\left(1 - \frac{z}{\sqrt{z^2 + R^2}}\right)$$
$$V = \frac{1}{4\pi\varepsilon_0}\frac{q}{r}$$

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

$$\Phi = \sum \vec{E} \times \Delta\vec{A}$$
$$\Phi = \oint \vec{E} \cdot \Delta\vec{A}$$

$$\varepsilon_0 \Phi = q_{enc}$$
$$\varepsilon_0 \oint \vec{E} \cdot \Delta\vec{A} = q_{enc}$$

$$E = \frac{\sigma}{\varepsilon_0}$$
$$E = \frac{\lambda}{2\pi\varepsilon_0 r}$$

$$E = \frac{\sigma}{2\varepsilon_0}$$
$$E = \left(\frac{q}{4\pi\varepsilon_0 R^3}\right)r$$

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

$$C_{eq} = \sum_{j=1}^{n} C_j = C_1 + C_2 + \cdots + C_j$$
$$\frac{1}{C_{eq}} = \sum_{j=1}^{n}\frac{1}{C_j} = \frac{1}{C_1} + \frac{1}{C_2} + \cdots + \frac{1}{C_j}$$

$$U_C = \frac{1}{2}CV^2$$
$$U_E = \frac{q^2}{2C}$$
$$u_E = \frac{1}{2}\varepsilon_0 E^2$$

$$C = \kappa C_{air}$$
$$\varepsilon_0 \oint \kappa\vec{E} \cdot d\vec{A} = q$$
$$i = \int JdA = J\int dA = JA$$

$$v_d = \frac{i}{nAe} = \frac{J}{ne}$$
$$i = \frac{dq}{dt}$$

$$\rho = \frac{E}{J}$$
$$\sigma = \frac{1}{\rho}$$

$$R = \rho\frac{L}{A}$$
$$\vec{J} = \sigma\vec{E}$$

$$\rho - \rho_0 = \rho_0 \alpha(T - T_0)$$
$$E = \left(\frac{m}{e^2 n\tau}\right)J$$

$$P = iV$$
$$P = \frac{V^2}{R}$$
$$\tau_C = RC$$

$$P = i^2 R$$
$$P_{emf} = i\mathcal{E}$$

$$V = iR$$
$$\mathcal{E} = iR$$
$$\mathcal{E} = \frac{dW}{dq}$$

$$R_{eq} = \sum_{j=1}^{n} R_j = R_1 + R_2 + \cdots + R_j$$
$$\frac{1}{R_{eq}} = \sum_{j=1}^{n}\frac{1}{R_j} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots + \frac{1}{R_j}$$

$$q = C\mathcal{E}(1 - e^{-t/RC})$$
$$I_t = +\frac{\mathcal{E}}{R}e^{-t/RC}$$

$$q = q_0 e^{-t/RC}$$
$$I_t = -\frac{\mathcal{E}}{R}e^{-t/RC}$$

$$f = \frac{1}{T} = \frac{|q|B}{2\pi m}$$

$$T = \frac{2\pi r}{v} = \frac{2\pi}{v}\frac{mv}{|q|B} = \frac{2\pi m}{|q|B}$$

$$\omega = 2\pi f = \frac{|q|B}{m}$$

$d\vec{F_B} = i\,d\vec{L} \times \vec{B}$	$\vec{F_B} = i\,\vec{L} \times \vec{B}$	$\tau = (Ni\pi r^2)B\sin\theta$	$\mu = NiA$	$\vec{\tau} = \vec{\mu} \times \vec{B}$
$d\vec{B} = \dfrac{\mu_0}{4\pi}\dfrac{i\,d\vec{s}\times\hat{r}}{r^2}$	$B = \dfrac{\mu_0 i}{2\pi R}$	$B = \dfrac{\mu_0 i \Phi}{4\pi R}$	$\vec{F}_{ba} = i_b\vec{L}\times\vec{B}_a$ $U_{(\theta)} = -\vec{\mu}\cdot\vec{B}$	$\dfrac{F_{ba}}{l} = \dfrac{\mu_0 i_1 i_2}{2\pi a}$
$B = \dfrac{\mu_0 iN}{2\pi}\dfrac{1}{r}$	$\vec{B}_{(z)} = \dfrac{\mu_0}{2\pi}\dfrac{\vec{\mu}}{z^3}$	$B = \mu_0 in$ $\vec{F_B} = q\vec{v}\times\vec{B}$	$\mathcal{E} = -N\dfrac{d\Phi_B}{dt}$	$\Phi_B = \displaystyle\int \vec{B}\cdot d\vec{A}$ $\displaystyle\oint \vec{B}\cdot d\vec{s} = \mu_0 i_{enc}$
$\displaystyle\oint \vec{E}\cdot d\vec{s} = -\dfrac{d\Phi_B}{dt}$	$L = \dfrac{N\Phi_B}{i}$	$\dfrac{L}{l} = \mu_0 n^2 A$	$\mathcal{E}_L = -L\dfrac{di}{dt}$	$i = \dfrac{\mathcal{E}}{R}\left(1 - e^{-t/\tau_L}\right)$ $\tau_L = \dfrac{L}{R}$
$i = \dfrac{\mathcal{E}}{R}e^{-t/\tau_L} = i_0 e^{-t/\tau_L}$	$U_B = \dfrac{1}{2}Li^2$	$u_B = \dfrac{B^2}{2\mu_0}$	$\omega = \dfrac{1}{\sqrt{LC}}$	$q = Q\cos(\omega t + \Phi)$
$i = \dfrac{dq}{dt} = -\omega Q\sin(\omega t + \Phi)$	$U_E = \dfrac{q^2}{2C} = \dfrac{Q^2}{2C}\cos^2(\omega t + \Phi)$		$U_B = \dfrac{Q^2}{2C}\sin^2(\omega t + \Phi)$	
$V_R = I_R R$	$v_c = V_C\sin\omega_d t$	$q_c = Cv_c = CV_C\sin\omega_d t$	$V_C = I_C X_C$	$v_L = V_L\sin\omega_d t$
$V_L = I_L X_L$	$X_C = \dfrac{1}{\omega_d C}$	$X_L = \omega_d L$	$\mathcal{E} = \mathcal{E}_m\sin\omega_d t$	$i = I\sin(\omega_d t - \Phi)$
$I = \dfrac{\mathcal{E}_m}{\sqrt{R^2 + (X_L - X_C)^2}}$	$Z = \sqrt{R^2 + (X_L - X_C)^2}$	$\tan\Phi = \dfrac{X_L - X_C}{R}$	$I_{rms} = \dfrac{I}{\sqrt{2}}$	
$P_{avg} = I_{rms}^2 R$	$V_{rms} = \dfrac{V}{\sqrt{2}}$	$\mathcal{E}_{rms} = \dfrac{\mathcal{E}_m}{\sqrt{2}}$	$P_{avg} = \mathcal{E}_{rms}I_{rms}\cos\Phi$	$V_s = V_p\dfrac{N_s}{N_p}$
$I_s = I_p\dfrac{N_p}{N_s}$	$R_{eq} = \left(\dfrac{N_p}{N_s}\right)^2 R$	$\displaystyle\oint \vec{E}\cdot d\vec{A} = q_{enc}/\varepsilon_0$	$\Phi_B = \displaystyle\oint \vec{B}\cdot d\vec{A} = 0$	$i_d = \varepsilon_0\dfrac{d\phi_E}{dt}$
$\displaystyle\oint \vec{E}\cdot d\vec{s} = -\dfrac{d\Phi_B}{dt}$	$\displaystyle\oint \vec{B}\cdot d\vec{s} = \mu_0 i_{enc} + \mu_0 i_{d,enc}$		$E = E_m\sin(kx - \omega t)$ $B = B_m\sin(kx - \omega t)$	$c = \dfrac{1}{\sqrt{\mu_0\varepsilon_0}}$
$\dfrac{E_m}{B_m} = \dfrac{E}{B} = c$	$\lambda = \dfrac{c}{f}$	$\vec{S} = \dfrac{1}{\mu_0}\vec{E}\times\vec{B}$	$I = S_{avg} = \dfrac{1}{c\mu_0}[E^2]_{avg}$	$E_{rms} = \dfrac{E_m}{\sqrt{2}}$
$I = \dfrac{1}{c\mu_0}E_{rms}^2$		$u_E = \dfrac{B^2}{2\mu_0}$		$I = \dfrac{power}{area} = \dfrac{P_s}{4\pi r^2}$