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

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

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

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

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

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

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

$$\vec{E} = \frac{\vec{F}}{q_0} = \frac{1}{4\pi\varepsilon_0} \frac{q}{r^2} \hat{r}$$
$$E = \frac{1}{2\pi\varepsilon_0} \frac{p}{z^3}$$
$$E = \int \frac{1}{4\pi\varepsilon_0} \frac{dq}{r^2}$$
$$E_s = -\frac{\partial V}{\partial s}$$

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

$$E = \frac{qz}{4\pi\varepsilon_0 (z^2 + R^2)^{3/2}}$$
$$E = \frac{\sigma}{2\varepsilon_0}\left(1 - \frac{z}{\sqrt{z^2 + R^2}}\right)$$
$$V = \frac{U}{q}$$
$$K_i + U_i = K_f + U_f$$
$$V = \frac{1}{4\pi\varepsilon_0} \frac{q}{r}$$
$$V = \sum_{i=1}^{n} V_i = \frac{1}{4\pi\varepsilon_0} \sum_{i=1}^{n} \frac{q_i}{r_i}$$

$$\Phi = \sum \vec{E} \times \Delta\vec{A}$$
$$\Phi = \oint \vec{E} \cdot \Delta\vec{A}$$
$$\varepsilon_0 \Phi = q_{enc}$$
$$\varepsilon_0 \oint \vec{E} \cdot \Delta\vec{A} = q_{enc}$$
$$E = \frac{\sigma}{\varepsilon_0} \qquad E = \frac{\sigma}{2\varepsilon_0}$$
$$E = \frac{\lambda}{2\pi\varepsilon_0 r} \qquad E = \left(\frac{q}{4\pi\varepsilon_0 R^3}\right) r$$
$$q = CV \qquad C = \frac{\varepsilon_0 A}{d}$$

$$C_{eq} = \sum_{j=1}^{n} C_j = C_1 + C_2 + \cdots + C_j$$
$$\frac{1}{C_{eq}} = \sum_{j=1}^{n} \frac{1}{C_j} = \frac{1}{C_1} + \frac{1}{C_2} + \cdots + \frac{1}{C_j}$$
$$U_C = \frac{1}{2} C V^2 \qquad U_E = \frac{q^2}{2C} \qquad u_E = \frac{1}{2} \varepsilon_0 E^2$$
$$C = \kappa C_{air}$$
$$\varepsilon_0 \oint \kappa \vec{E} \cdot d\vec{A} = q$$
$$v_d = \frac{i}{nAe} = \frac{J}{ne}$$
$$i = \int J dA = J \int dA = JA$$
$$i = \frac{dq}{dt}$$

$$\rho = \frac{E}{J} \qquad \sigma = \frac{1}{\rho}$$
$$R = \rho \frac{L}{A} \qquad \vec{J} = \sigma \vec{E}$$
$$\rho - \rho_0 = \rho_0 \alpha (T - T_0)$$
$$E = \left(\frac{m}{e^2 n \tau}\right) J$$
$$P = iV \qquad P = i^2 R$$
$$P = \frac{V^2}{R} \qquad P_{emf} = i\mathcal{E}$$
$$\tau_C = RC$$
$$V = iR \qquad \mathcal{E} = iR \qquad \mathcal{E} = \frac{dW}{dq}$$

$$R_{eq} = \sum_{j=1}^{n} R_j = R_1 + R_2 + \cdots + R_j$$
$$\frac{1}{R_{eq}} = \sum_{j=1}^{n} \frac{1}{R_j} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots + \frac{1}{R_j}$$
$$q = C\mathcal{E}\left(1 - e^{-t/RC}\right) \qquad I_t = +\frac{\mathcal{E}}{R} e^{-t/RC}$$
$$q = q_0 e^{-t/RC} \qquad I_t = -\frac{\mathcal{E}}{R} e^{-t/RC}$$
$$f = \frac{1}{T} = \frac{|q|B}{2\pi m}$$
$$T = \frac{2\pi r}{v} = \frac{2\pi}{v} \frac{mv}{|q|B} = \frac{2\pi m}{|q|B}$$
$$\omega = 2\pi f = \frac{|q|B}{m}$$

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