

$\mu_0 = 4\pi \times 10^{-7} T \cdot m/A = 1.26 \times 10^{-6} T \cdot m/A$	$C = 4\pi\epsilon_0 \frac{ab}{b-a}$ spherical
$k = \frac{1}{4\pi\epsilon_0} = 8.99 \times 10^9 N \cdot m^2/C^2$	$C = 4\pi\epsilon_0 R$ sphere
$\epsilon_0 = 8.85 \times 10^{-12} C^2/(N \cdot m^2) \quad e = 1.60 \times 10^{-19} C$	$C_{eq} = \frac{\sum_{j=1}^n C_j}{1}$
$G = 6.67 \times 10^{-11} N \cdot m^2/kg^2$	$C_{eq} = \frac{1}{\sum_{j=1}^n \frac{1}{C_j}}$
$g = 9.8 m/s^2 \quad c = 3.00 \times 10^8 m/s$	$U = \frac{q^2}{2C}$
$N_A = 6.02 \times 10^{23} mol^{-1} \quad m_e = 9.11 \times 10^{-31} kg$	$U = \frac{1}{2} CV^2$
$m_p = 1.67 \times 10^{-27} kg \quad 1 m = 3.28 ft$	$i \equiv \frac{dq}{dt}$
$1 lb = 4.45 N \quad 1 eV = 1.6 \times 10^{-19} J$	$i = \int \mathbf{J} \cdot d\mathbf{A}$
$\frac{d}{dx} x = 1 \quad \frac{d}{dx} (au) = a \frac{du}{dx}$	$J = \frac{I}{A}$
$\frac{d}{dx} (u+v) = \frac{du}{dx} + \frac{dv}{dx} \quad \frac{d}{dx} x^m = mx^{m-1}$	$V = \frac{A}{IR}$
$\frac{d}{dx} (uv) = u \frac{dv}{dx} + v \frac{du}{dx}$	$\rho \equiv \frac{J}{E}$
$\int dx = x \quad \int au dx = a \int u dx$	$\mathbf{E} = \rho \mathbf{J}$
$\int (u+v) dx = \int u dx + \int v dx$	$\sigma \equiv \frac{1}{\rho}$
$\int x^m dx = \frac{x^{m+1}}{m+1} \quad (m \neq -1)$	$R = \rho \frac{L}{A}$
$F = k \frac{ q_1  q_2 }{r^2}$	$P = \frac{i^2 R}{V^2}$
$dq = i dt \quad q = ne$	$P = \frac{R}{E}$
$\vec{E} = \frac{\vec{F}}{q_0}$	$P = \frac{t}{dW}$
$E = \frac{1}{4\pi\epsilon_0} \frac{ q }{r^2}$	$\mathcal{E} = \frac{dq}{dW}$
$E = \frac{qz}{4\pi\epsilon_0 (z^2 + R^2)^{3/2}}$ (ring)	$i = \frac{\mathcal{E}}{R}$
$E = \frac{\sigma}{2\epsilon_0} \left(1 - \frac{z}{\sqrt{z^2 + R^2}}\right)$ (disk)	$R_{eq} = \frac{R}{\sum_{j=1}^n R_j}$
$\Phi = \oint \vec{E} \cdot d\vec{A}$	$\frac{1}{R_{eq}} = \sum_{j=1}^n \frac{1}{R_j}$
$\epsilon_0 \Phi = q_{enc}$	$P_{emf} = i\mathcal{E}$
$\epsilon_0 \oint \vec{E} \cdot d\vec{A} = q_{enc}$	$q = q_0 e^{-t/RC}$
$E = \frac{\sigma}{\epsilon_0}$ (surface)	$\vec{F}_B = q\vec{v} \times \vec{B}$
$E = \frac{\sigma}{2\epsilon_0}$ (sheet)	$F_B =  q vB \sin \phi$
$E = \frac{\lambda}{2\pi\epsilon_0 r}$ (line)	$qvB = \frac{mv^2}{r}$
$V \equiv \frac{U}{q} = \frac{-W}{q}$	$r = \frac{qB}{2\pi m}$
$V = V_f - V_i = - \int_i^f \vec{E} \cdot d\vec{s}$	$T = \frac{qB}{qB}$
$V = \frac{1}{4\pi\epsilon_0} \frac{q}{r}$	$f = \frac{2\pi m}{qB}$
$V = \frac{1}{\sum_i} \frac{q_i}{4\pi\epsilon_0 r_i}$	$\omega = \frac{m}{qB}$
$V = \int dv = k \int \frac{dq}{r}$	$\vec{F}_B = i\vec{L} \times \vec{B}$
$E_s = -\frac{\partial V}{\partial s}$	$d\vec{F}_B = i d\vec{L} \times \vec{B}$
$E_x = -\frac{\partial V}{\partial x}$	$d\vec{B} = \frac{\mu_0 i d\vec{s} \times \vec{r}}{4\pi r^3}$
$E_y = -\frac{\partial V}{\partial y}$	$B = \frac{\mu_0 i}{2\pi r}$ (long straight wire)
$U = \frac{kq_1q_2}{r}$	$B = \frac{\mu_0 i \phi}{4\pi R}$ (arc)
$q = CV$	$F_{ba} = \frac{\mu_0 I i_a i_b}{2\pi d}$ (two straight wires)
$C = \frac{\epsilon_0 A}{d}$ parallel	$\oint \vec{B} \cdot d\vec{s} = \mu_0 i_{enc}$
$C = 2\pi\epsilon_0 \frac{L}{\ln(b/a)}$ cylindrical	$B = \mu_0 in$ (solenoid)
	$B = \frac{\mu_0 i N}{2\pi r}$ (toroid)
	$\Phi_B = \int \vec{B} \cdot d\vec{A}$ (magnetic flux)
	$\Phi_B = BA$

$$\begin{aligned}
\mathcal{E} &= -\frac{d\Phi_B}{dt} \quad (\text{Faraday's Law}) \\
\oint \vec{E} \cdot d\vec{s} &= -\frac{d\Phi_B}{dt} \\
L &= \frac{N\Phi}{i} \quad (\text{inductance}) \\
\frac{L}{l} &= \mu_0 n^2 A \quad (\text{solenoid}) \\
\mathcal{E}_L &= -L \frac{di}{dt} \\
L \frac{di}{dt} + Ri &= \mathcal{E} \\
\tau_L &= \frac{L}{R} \\
i &= i_0 e^{-t/\tau_L} \\
U_B &= \frac{1}{2} Li^2 \\
(1)
\end{aligned}$$