$$\mu_0 = 4\pi \times 10^{-7} T \cdot m/A = 1.26 \times 10^{-6} T \cdot m/A$$
$$k = \frac{1}{4\pi\epsilon_0} = 8.99 \times 10^9 \ N \cdot m^2/C^2$$
$$\epsilon_0 = 8.85 \times 10^{-12} \ C^2/\left(N \cdot m^2\right) \quad e = 1.60 \times 10^{-19} C$$
$$G = 6.67 \times 10^{-11} \ N \cdot m^2/kg^2$$
$$g = 9.8 m/s^2 \quad c = 3.00 \times 10^8 m/s$$
$$N_{\mathrm{A}} = 6.02 \times 10^{23} \ \mathrm{mol}^{-1} \quad m_{\mathrm{e}} = 9.11 \times 10^{-31} \ kg$$
$$m_{\mathrm{p}} = 1.67 \times 10^{-27} \ kg \quad 1 \text{ m} = 3.28 \text{ ft}$$
$$1 \text{ lb} = 4.45 \ N \quad 1 \text{ eV} = 1.6 \times 10^{-19} J$$
$$\frac{d}{dx} x = 1 \quad \frac{d}{dx}(au) = a\frac{du}{dx}$$
$$\frac{d}{dx}(u+v) = \frac{du}{dx} + \frac{dv}{dx} \quad \frac{d}{dx} x^m = m x^{m-1}$$
$$\frac{d}{dx}(uv) = u\frac{dv}{dx} + v\frac{du}{dx}$$
$$\int dx = x \quad \int au \ dx = a \int u \ dx$$
$$\int (u+v)\, dx = \int u \ dx + \int v \ dx$$
$$\int x^m \ dx = \frac{x^{m+1}}{m+1} \quad (m \neq -1)$$
$$F = k\frac{|q_1||q_2|}{r^2}$$
$$dq = i \ dt \quad q = ne$$
$$\vec{E} = \frac{\vec{F}}{q_0}$$
$$E = \frac{1}{4\pi\epsilon_0}\frac{|q|}{r^2}$$
$$E = \frac{qz}{4\pi\epsilon_0 \left(z^2 + R^2\right)^{3/2}} \quad \text{(ring)}$$
$$E = \frac{\sigma}{2\epsilon_0}\left(1 - \frac{z}{\sqrt{z^2 + R^2}}\right) \quad \text{(disk)}$$
$$\Phi = \oint \vec{E} \cdot d\vec{A}$$
$$\epsilon_0 \Phi = q_{\mathrm{enc}}$$
$$\epsilon_0 \oint \vec{E} \cdot d\vec{A} = q_{\mathrm{enc}}$$
$$E = \frac{\sigma}{\epsilon_0} \quad \text{(surface)}$$
$$E = \frac{\sigma}{2\epsilon_0} \quad \text{(sheet)}$$
$$E = \frac{\lambda}{2\pi\epsilon_0 r} \quad \text{(line)}$$
$$V \equiv \frac{U}{q} = \frac{-W}{q}$$
$$V = = V_f - V_i = -\int_i^f \vec{E} \cdot d\vec{s}$$
$$V = \frac{1}{4\pi\epsilon_0}\frac{q}{r}$$
$$V = \Sigma_i \frac{1}{4\pi\epsilon_0}\frac{q_i}{r_i}$$
$$V = \int dv = k \int \frac{dq}{r}$$

$$E_s = -\frac{\partial V}{\partial s}$$
$$E_x = -\frac{\partial V}{\partial x}$$
$$E_y = -\frac{\partial V}{\partial y}$$
$$U = \frac{k q_1 q_2}{r}$$
$$q = CV$$
$$C = \frac{\epsilon_0 A}{d} \quad \text{parallel}$$
$$C = 2\pi\epsilon_0 \frac{L}{\ln(b/a)} \quad \text{cylindrical}$$
$$C = 4\pi\epsilon_0 \frac{ab}{b-a} \quad \text{spherical}$$
$$C = 4\pi\epsilon_0 R \quad \text{sphere}$$
$$C_{\mathrm{eq}} = \Sigma_{j=1}^n C_j$$
$$C_{\mathrm{eq}} = \frac{1}{\Sigma_{j=1}^n \frac{1}{C_j}}$$
$$U = \frac{q^2}{2C}$$
$$U = \frac{1}{2} C V^2$$
$$i \equiv \frac{dq}{dt}$$
$$i = \int \mathbf{J} \cdot d\mathbf{A}$$
$$J = \frac{I}{A}$$
$$V = IR$$
$$\rho \equiv \frac{E}{J}$$
$$\mathbf{E} = \rho \mathbf{J}$$
$$\sigma \equiv \frac{1}{\rho}$$
$$R = \rho\frac{L}{A}$$
$$P = i^2 R$$
$$P = \frac{V^2}{R}$$
$$P = \frac{E}{t}$$
$$P = iV$$
$$\mathcal{E} = \frac{dW}{dq}$$
$$i = \frac{\mathcal{E}}{R}$$
$$R_{\mathrm{eq}} = \Sigma_{j=1}^n R_j$$
$$\frac{1}{R_{\mathrm{eq}}} = \Sigma_{j=1}^n \frac{1}{R_j}$$
$$P_{\mathrm{emf}} = i\mathcal{E}$$
$$q = q_0 e^{-t/RC}$$
$$\vec{F}_B = q\vec{v} \times \vec{B}$$
$$F_B = |q| v B \sin\phi$$
$$qvB = \frac{mv^2}{r}$$

$$
\begin{aligned}
r &= \frac{mv}{qB} \\
T &= \frac{2\pi m}{qB} \\
f &= \frac{qB}{2\pi m} \\
\omega &= \frac{qB}{m} \\
\vec{F}_B &= i\vec{L} \times \vec{B} \\
d\vec{F}_B &= i\ d\vec{L} \times \vec{B} \\
d\vec{B} &= \frac{\mu_0}{4\pi} \frac{i\ d\vec{s} \times \vec{r}}{r^3} \\
B &= \frac{\mu_0 i}{2\pi r} \quad \text{(long straight wire)} \\
B &= \frac{\mu_0 i \phi}{4\pi R} \quad \text{(arc)} \\
F_{ba} &= \frac{\mu_0 L i_a i_b}{2\pi d} \quad \text{(two straight wires)} \\
\oint \vec{B} \cdot d\vec{s} &= \mu_0 i_{\text{enc}} \\
B &= \mu_0 i n \quad \text{(solenoid)} \\
B &= \frac{\mu_0 i N}{2\pi} \frac{1}{r} \quad \text{(toroid)} \\
\Phi_B &= \int \vec{B} \cdot d\vec{A} \quad \text{(magnetic flux)} \\
\Phi_B &= BA \\
\mathcal{E} &= -\frac{d\Phi_B}{dt} \quad \text{(Faraday's Law)} \\
\oint \vec{E} \cdot d\vec{s} &= -\frac{d\Phi_B}{dt} \\
L &= \frac{N\Phi}{i} \quad \text{(inductance)} \\
\frac{L}{l} &= \mu_0 n^2 A \quad \text{(solenoid)} \\
\mathcal{E}_L &= -L\frac{di}{dt} \\
L\frac{di}{dt} + Ri &= \mathcal{E} \\
\tau_L &= \frac{L}{R} \\
i &= i_0 e^{-t/\tau_L} \\
U_B &= \frac{1}{2} L i^2 \\
I_{\text{rms}} &= \frac{I}{\sqrt{2}} \\
P_{\text{av}} &= I_{\text{rms}}^2 R \\
c &= 299,792,458 m/s \\
I &= \frac{1}{2} I_0 \quad \text{(unpolarized)} \\
I &= I_0 \cos^2\theta \quad \text{polarized)} \\
\theta_1' &= \theta_1 \quad \text{(reflection)} \\
n_2 \sin\theta_2 &= n_1 \sin\theta_1 \quad \text{(refraction)} \\
\theta_c &= \sin^{-1} \frac{n_2}{n_1} \\
s &= -s \\
|f| &= \frac{1}{2} r \quad \text{(focal length)} \\
\frac{1}{s} + \frac{1}{s'} &= \frac{1}{f}
\end{aligned}
$$

$$
\begin{aligned}
|m| &= \frac{h'}{h} \quad \text{(magnification)} \\
m &= -\frac{s'}{s} \\
\beta &= \frac{v}{c} \\
\gamma &= \frac{1}{\sqrt{1-\beta^2}} \\
\Delta t &= \gamma \Delta_0 \\
l &= l_0/\gamma \\
K &= (\gamma - 1)\, mc^2 \\
E &= \gamma mc^2
\end{aligned}
$$