Constants:

$$
\begin{aligned}
k_e &\equiv 1/4\pi\epsilon_o = 8.98755\times 10^{9}\ \mathrm{N\cdot m^2\cdot C^{-2}}\\
\epsilon_o &= 8.85\times 10^{-12}\ \mathrm{C^2/N\cdot m^2}\\
\mu_o &\equiv 4\pi\times 10^{-7}\ \mathrm{T\cdot m/A}\\
c^2 &= 1/\mu_o\epsilon_o\\
e &= 1.60218\times 10^{-19}\ \mathrm{C}\\
m_{e^-} &= 9.10938\times 10^{-31}\ \mathrm{kg}\\
m_{p^+} &= 1.67262\times 10^{-27}\ \mathrm{kg}\\
1\ \mathrm{u} &= 931.494\ \mathrm{MeV}/c^2\\
g &= 9.81\ \mathrm{m/s^2}
\end{aligned}
$$

Basic Equations:

$$
\begin{aligned}
0 &= ax^2+bx^2+c \Longrightarrow x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}\\
\vec{\mathbf{F}}_{\text{centr}} &= -\frac{mv^2}{r}\hat{\mathbf{r}}\ \ \text{Centripetal}
\end{aligned}
$$

Electric Force & Field:

$$
\begin{aligned}
\vec{\mathbf{F}}_{12} &= k_e\frac{q_1q_2}{r^2}\,\hat{\mathbf{r}} = q_2\vec{\mathbf{E}}_1\\
\vec{\mathbf{E}}_1 &= \vec{\mathbf{F}}_{12}/q_2 = k_e\frac{q_1}{r^2}\,\hat{\mathbf{r}}\\
\vec{\mathbf{E}} &= k_e\sum_i\frac{q_i}{r_i^2}\,\hat{\mathbf{r}}_i \rightarrow k_e\int\frac{dq}{r^2}\,\hat{\mathbf{r}} = k_e\int\frac{\rho\hat{\mathbf{r}}}{r^2}\,dV_{ol}
\end{aligned}
$$

Electric Potential (static case!):

$$
\begin{aligned}
\Delta V &= V_B - V_A = \frac{\Delta U}{q} = -\int_A^B\vec{\mathbf{E}}\cdot d\vec{\mathbf{l}}\\
V_{\text{point}} &= k_e\frac{q}{r}\\
V &= k_e\int\frac{dq}{r}\quad\text{continuous}\\
E_x &= -\frac{dV}{dx}\rightarrow\vec{\mathbf{E}} = -\vec{\boldsymbol{\nabla}}V\\
Q &= C\Delta V\quad\text{capacitor}
\end{aligned}
$$

Current & Resistance:

$$
\begin{aligned}
I &= \int_S\vec{\mathbf{J}}\cdot d\vec{\mathbf{A}} \xrightarrow{\text{uniform J}} I=\frac{dQ}{dt}=nqAv_d\\
J &= \frac{I}{A} = nqv_d\quad\text{uniform J}\\
\int_S\vec{\mathbf{J}}\cdot d\vec{\mathbf{A}} &= -\frac{d}{dt}\int_V\rho\,dV_{ol}\\
R &= \frac{\varrho l}{A}\quad\rho=1/\sigma\\
\mathscr{P} &= U\cdot\Delta t = I\Delta V\quad\text{power}\\
R_{\text{eq}} &= R_1+R_2+\ldots\quad\text{series}\\
1/R_{\text{eq}} &= 1/R_1+1/R_2+\ldots\quad\text{parallel}\\
\sum I_{\text{in}} &= \sum I_{\text{out}}\quad\text{junction}\\
\sum_{\text{closed path}}\Delta V &= 0\quad\text{loop}
\end{aligned}
$$

Magnetism:

$$
\begin{aligned}
\vec{\mathbf{F}}_B &= q\vec{\mathbf{v}}\times\vec{\mathbf{B}}\\
d\vec{\mathbf{F}}_B &= Id\vec{\mathbf{l}}\times\vec{\mathbf{B}}\quad\text{I-carrying wire}\\
d\vec{\mathbf{B}} &= \frac{\mu_o}{4\pi}\frac{Id\vec{\mathbf{l}}\times\hat{\mathbf{r}}}{r^2}\quad\text{wire}\\
B &= \frac{\mu_oNI}{l} = \mu_onI\quad\text{solenoid}\\
\frac{F_B}{l} &= \frac{\mu_oI_1I_2}{2\pi d}\quad\text{2 wires}\\
\Phi_B &= \oint\vec{\mathbf{B}}\cdot d\vec{\mathbf{A}}\\
\vec{\boldsymbol{\tau}} &= \vec{\boldsymbol{\mu}}\times\vec{\mathbf{B}}\quad\text{with}\quad\vec{\boldsymbol{\mu}}=I\vec{\mathbf{A}}\quad\text{I loop}\\
U &= -\vec{\boldsymbol{\mu}}\times\vec{\mathbf{B}}
\end{aligned}
$$

Induction & Maxwell

$$
\begin{aligned}
\Delta V &= \oint\vec{\mathbf{E}}\cdot d\vec{\mathbf{l}} = -\frac{d\Phi_B}{dt}\\
\Delta V &= Blv\quad\text{motional}\\
\Phi_E &= \oint\vec{\mathbf{E}}\cdot d\vec{\mathbf{A}} = 4\pi k_eq_{\text{encl}} = \frac{q_{\text{encl}}}{\epsilon_o}\\
\oint\vec{\mathbf{B}}\cdot d\vec{\mathbf{A}} &= 0\\
\oint\vec{\mathbf{B}}\cdot d\vec{\mathbf{l}} &= \mu_oI+\frac{1}{c^2}\frac{d\Phi_E}{dt}
\end{aligned}
$$

Vectors:

$$
\begin{aligned}
|\vec{\mathbf{F}}| &= \sqrt{F_x^2+F_y^2}\quad\text{magnitude}\\
\theta &= \tan^{-1}\left[\frac{F_y}{F_x}\right]\quad\text{direction}\\
\hat{\mathbf{r}} &= \vec{\mathbf{r}}/|\vec{\mathbf{r}}|\\
d\vec{\mathbf{l}} &= dx\,\hat{\mathbf{x}}+dy\,\hat{\mathbf{y}}+dz\,\hat{\mathbf{z}}
\end{aligned}
$$

let $\vec{\mathbf{a}} = a_x\,\hat{\mathbf{x}}+a_y\,\hat{\mathbf{y}}+a_z\,\hat{\mathbf{z}}$ and $\vec{\mathbf{b}} = b_x\,\hat{\mathbf{x}}+b_y\,\hat{\mathbf{y}}+b_z\,\hat{\mathbf{z}}$

$$
\vec{\mathbf{a}}\cdot\vec{\mathbf{b}} = a_xb_x+a_yb_y+a_zb_z = \sum_{i=1}^n a_ib_i = |\vec{\mathbf{a}}||\vec{\mathbf{b}}|\cos\theta
$$

$$
|\vec{\mathbf{a}}\times\vec{\mathbf{b}}| = |\vec{\mathbf{a}}||\vec{\mathbf{b}}|\sin\theta
$$

$$
\vec{\mathbf{a}}\times\vec{\mathbf{b}} = \begin{vmatrix}\hat{\mathbf{x}} & \hat{\mathbf{y}} & \hat{\mathbf{z}}\\ a_x & a_y & a_z\\ b_x & b_y & b_z\end{vmatrix} = (a_yb_z-a_zb_y)\,\hat{\mathbf{x}}+(a_zb_x-a_xb_z)\,\hat{\mathbf{y}}+(a_xb_y-a_yb_x)\,\hat{\mathbf{z}}
$$

Derived unit	Symbol	equivalent to
newton	N	kg·m/s^2
joule	J	kg·m^2/s^2 = N·m
watt	W	J/s=m^2·kg/s^3
coulomb	C	A·s
V	W/A = m^2·kg/·s^3·A	
farad	F	C/V = A^2·s^4/m^2·kg
ohm	Ω	V/A = m^2·kg/s^3·A^2
tesla	T	Wb/m^2 = kg/s^2·A
electron volt	eV	1.6×10^{-19} J
-	1 T · m/A	1 N/A^2
-	1 T · m^2	1 V · s
-	1 N/C	1 V/m

Right-hand rule #1

1. Point the fingers of your right hand along the direction of $\vec{\mathbf{v}}$.
2. Point your thumb in the direction of $\vec{\mathbf{B}}$.
3. The magnetic force on a + charge points out from the back of your hand.

Right-hand rule #2:
Point your right thumb along the wire in the direction of the current. Your fingers curl around the direction of the magnetic field, which circulates around the wire.