Constants

Magnitude of electron charge	$e = 1.60 \times 10^{-19}\,\mathrm{C}$
Coulomb's constant	$k = 8.99 \times 10^{9}\,\mathrm{N.m^2C^{-2}}$
Permittivity of free space	$\epsilon_0 = \dfrac{1}{4\pi k}$
	$\epsilon_0 = 8.85 \times 10^{-12}\,\mathrm{C^2N^{-1}m^{-2}}$
Permeability of free space	$\mu_0 = 4\pi \times 10^{-7}\,\mathrm{H.m^{-1}}$
Mass of electron	$m_e = 9.11 \times 10^{-31}\,\mathrm{kg}$

Equations from 121

Kinematics (1-dim)	$x = x_0 + v_0 t + at^2/2$
	$v = v_0 x + at$
	$v^2 = v_0^2 + 2a\Delta x$
Kinetic energy	$K = \frac{1}{2}mv^2$
Newton's 2nd law	$\vec{F}_{net} = m\vec{a}$
Newton's 3rd law	$\vec{F}_{12} = -\vec{F}_{21}$

Electrostatics

Coulomb's Law	$\vec{F}_{12} = \dfrac{kq_1q_2}{r_{12}^2}\hat{r}_{12}$
Electric field	$\vec{E} = \vec{F}/q$
Dipole moment	$\vec{p} = q\vec{L}$
Torque on a dipole	$\vec{\tau} = \vec{p} \times \vec{E}$
Potential energy of a dipole	$U = -\vec{p}\cdot\vec{E}$
Electric flux	$\phi = \int \vec{E}\cdot d\vec{A}$
Electric flux for uniform field	$\phi = \lvert\vec{E}\rvert A\cos\theta$
Gauss's law	$\phi_{net} = \oint \vec{E}\cdot d\vec{A} = Q_{enc}/\epsilon_0$
Potential difference	$\Delta V = \dfrac{\Delta U}{q_0} = -\displaystyle\int_a^b \vec{E}\cdot d\vec{L}$
Electric field from potential	$\vec{E} = -\vec{\nabla}V$ (magnitude = slope)
Pot. energy of point charges	$U = \sum_{\text{pairs}} kq_iq_j/r_{ij}$
E from point charge	$\vec{E} = \dfrac{kq}{r^2}\hat{r}$
E from system of charges	$\vec{E} = \displaystyle\sum_i \vec{E}_i$
E from infinite line of charge	$E_R = 2k\lambda/R$
E from infinite plane of charge	$E = \sigma/2\epsilon_0$
E from thin spherical shell	$E_r = \begin{cases} \frac{Q}{4\pi\epsilon_0 r^2}, & \text{if } r > R \\ 0, & \text{if } r < R \end{cases}$
E outside conductor	$E = \sigma/\epsilon_0$ (perp. to surface)
E inside conductor	$E = 0$
V from point charge	$V = \dfrac{kq}{r}$
V from system of point charges	$V = \displaystyle\sum_i \dfrac{kq_i}{r_i}$
V from thin spherical shell	$V = \begin{cases} \frac{kQ}{r}, & \text{if } r > R \\ \frac{kQ}{R}, & \text{if } r < R \end{cases}$

Capacitance

Capacitance	$C = Q/V$
Parallel plate capacitor	$C = \epsilon_0 A/d$
Cylindrical capacitor	$C = \dfrac{2\pi\epsilon_0 L}{\ln\left(R_2/R_1\right)}$
Energy stored in a capacitor	$U = \frac{1}{2}QV = \frac{1}{2}\frac{Q^2}{C} = \frac{1}{2}CV^2$
Energy density of an E field	$u_e = \frac{1}{2}\epsilon_0 E^2$
Parallel capacitors	$C_{eq} = C_1 + C_2 + ...$
Series capacitors	$\dfrac{1}{C_{eq}} = \dfrac{1}{C_1} + \dfrac{1}{C_2} + ...$
Electric field inside dielectric	$E = \frac{E_0}{\kappa}$
Capacitance with dielectric	$C = \kappa C_0$

Resistance and current

Electric current	$I = dQ/dt$
Current density	$J = I/A$
Current microscopic view	$I = qn_eAv_d$
Resistance	$R = V/I$
Resistivity, ρ	$R = \rho L/A$
Power loss in resistor	$P = IV = \frac{V^2}{R} = I^2R$
Series resistors	$R_{eq} = R_1 + R_2 + ...$
Parallel resistors	$\dfrac{1}{R_{eq}} = \dfrac{1}{R_1} + \dfrac{1}{R_2} + ...$

Power output of battery	$P = IV$
Discharging a capacitor	$Q(t) = Q_0 e^{-t/\tau}$
Charging a capacitor	$Q(t) = C\mathcal{E}(1 - e^{-t/\tau})$
Time constant	$\tau = RC$
Current in a capacitor	$I(t) = I_0 e^{-t/\tau}$

Kirchhoff's laws for circuits

Loop rule	$\sum_i \Delta V_i = 0$
Junction rule	$\sum I_{\text{in}} = \sum I_{\text{out}}$

Magnetic Fields

Force on moving charge	$\vec{F} = q\vec{v} \times \vec{B}$
Force on current element	$d\vec{F} = Id\vec{l} \times \vec{B}$
Force on current in wire	$\vec{F} = I\vec{L} \times \vec{B}$
Circular motion	$R = \frac{mv}{qB}$
Circular motion period	$T = \frac{2\pi m}{qB}$
Magnetic dipole moment	$\vec{\mu} = NI\vec{A}$
Torque on magnetic dipole	$\vec{\tau} = \vec{\mu} \times \vec{B}$
Mag. dipole potential energy	$U = -\vec{\mu} \cdot \vec{B}$
Hall effect	$V_H = E_H w = v_d B w = \frac{IB}{nte}$
Biot-Savart law	$d\vec{B} = \frac{\mu_0}{4\pi} \frac{Id\vec{s} \times \hat{r}}{r^2}$
B inside long solenoid	$B = \mu_0 n I$
B from long straight wire	$B = \frac{\mu_0}{2\pi} \frac{I}{R}$
Magnetic flux	$\phi_m = \int \vec{B} \cdot d\vec{A}$
Magnetic flux, for uniform field	$\phi_m = NBA\cos\theta$
Gauss's law for magnetism	$\phi_{m\,net} = \oint \vec{B} \cdot d\vec{A} = 0$
Ampere's law	$\oint \vec{B} \cdot d\vec{\ell} = \mu_0 I_{enc}$
Faraday's law	$\mathcal{E} = -\frac{d\phi_m}{dt}$
Rod moving in B field EMF	$\lvert\mathcal{E}\rvert = Blv$
Self inductance	$L = \frac{\phi_m}{I}$
Self inductance of solenoid	$L = \mu_0 n^2 A l$
Inductors in series	$L_{\text{eq}} = L_1 + L_2$
Mutual inductance	$M = \phi_{m21}/I_1 = \phi_{m12}/I_2$
Energy stored in inductor	$U = \frac{1}{2}LI^2$
Magnetic field energy density	$u_m = \frac{B^2}{2\mu_0}$
EMF across inductor	$\mathcal{E} = -L\frac{dI}{dt}$
Energizing an inductor	$I(t) = I_f(1 - e^{-t/\tau})$
De-energizing an inductor	$I(t) = I_0 e^{-t/\tau}$
Time constant	$\tau = L/R$