Laws, Principles, Useful Relationships, and Other Information

Coulomb's Rule $\vec{F}_e = k\frac{q_1 q_2}{r^2}\hat{r}$

The Definition of Electric Field $\vec{E} \equiv \frac{\vec{F}}{q}$

The Electric Field Due to a Point Charge $\vec{E} = k\frac{q}{r^2}\hat{r}$

The Electric Field Due to a Continuous Charge Distribution $\vec{E} = k\int\frac{dq}{r^2}\hat{r}$

The Definition of Electric Dipole Moment $\vec{p} \equiv q\vec{d}$

The Torque on a Dipole $\vec{\tau} = \vec{p} \times \vec{E}$

The Potential Energy of a Dipole $U = -\vec{p} \cdot \vec{E}$

The Definition of Electric Flux $\Phi \equiv \int \vec{E} \cdot d\vec{A}$

Gauss's Law $\oint \vec{E} \cdot d\vec{A} = \frac{q_{enclosed}}{\varepsilon_o}$

Physical Constants

$k = 8.99\text{x}10^{9}\frac{N\ m^2}{C^2}$ $\varepsilon_o = 8.85\text{x}10^{-12}\frac{C^2}{N\ m^2}$ $c = 3.00\text{x}10^{8}\,m/s$

$m_e = 9.11\text{x}10^{-31}kg$ $m_p = 1.67\text{x}10^{-27}kg$ $e = 1.60\text{x}10^{-19}C$

Areas and Volumes

sphere:	$A = 4\pi r^2$	$V = \frac{4}{3}\pi r^3$
cylinder:	$A = 2\pi r\ell + 2\pi r^2$	$V = \pi r^2 \ell$
cube:	$A = 6a^2$	$V = a^3$