Electrostatics

Equations:

Coulombs Law:

$$F = k\frac{q_1 q_2}{r^2} \quad = \frac{1}{4\pi\epsilon_0}\frac{q_1 q_2}{r^2}$$

Definition of E-field:

$$\vec{F} = q\vec{E}$$

Definitions of Electric Potential:

$$\Delta V = -E\Delta x\cos\theta, \qquad \Delta PE = q\Delta V$$

Gauss's Law:

$$EA\cos\theta = \frac{Q}{\epsilon_0}$$

Fields for point charges:

$$E = k\frac{Q}{r^2} \qquad V = k\frac{Q}{r}$$

Numbers:

$$e = 1.602 \cdot 10^{-19}\ C$$

$$k = 8.99 \cdot 10^{9}\ \left(\frac{Nm^2}{C^2}\right)$$

$$k = \frac{1}{4\pi\epsilon_0}, \quad \epsilon_0 = 8.85 \cdot 10^{-12}\ \left(\frac{C^2}{Nm^2}\right)$$

Assorted Facts:

1. Charge is conserved, net charge does not change.
2. No electric field exists inside conductors.
3. Electric fields at surfaces of conductors are $\perp$ to surface.
4. All points on or inside a conductor are at the same voltage.

Units:

Quantity	Units	Conversion
Electric Field	$(N/C),\ (V/m)$	$1(N/c) = 1(V/m)$
Charge	$(C),\ (e)$	$1e = 1.6 \cdot 10^{-19}C$
Voltage	$(V),\ (J/C)$	$1(V) = 1(J/C)$