Elementary charge: $1.602 \cdot 10^{-19}$
Proton mass: $1.673 \cdot 10^{-27}$
Electron mass: $9.11 \cdot 10^{-31}$

$$k = \frac{1}{4\pi\epsilon_0} = 9 \cdot 10^9$$

$$\epsilon_0 = 8.85 \cdot 10^{-12}$$

Charge Density

$$\lambda = \frac{Q}{L}$$

$$\eta = \frac{Q}{A}$$

$$\rho = \frac{Q}{V}$$

Point

$$F = qE$$

$$U = qV$$

$$E = \frac{kq}{r^2}$$

$$V = \frac{kq}{r}$$

$$U = \frac{kq_1q_2}{r}$$

Wire

$$E = \frac{2k|\lambda|}{r}$$

Plane

$$E = \frac{\eta}{2\epsilon_0}$$

Sphere

$$E = \frac{kQ}{r^2} \text{ for } r >= R$$

$$V = \frac{kQ}{r}$$

$$V = \frac{R}{r}V_0 \text{ if surface is charged to } V_0$$

Dipole

$$E = \frac{-2kp}{r^3} \text{ on axis}$$

$$E = \frac{-kp}{r^3} \text{ in bisecting plane}$$

$$p = qd$$

$$\tau = pE\sin\theta$$

$$V = -pE\cos\theta$$

Parallel-Plate Capacitor

$$E = \frac{Q}{\epsilon_0 A} \text{ from positive to negative plate}$$

$$U = qEs \text{ where } s \text{ is distance from negative plate}$$

$$V = \frac{s}{d}\Delta V_C$$

$$E = \frac{V}{d}$$

Electric Flux

$$\Phi = EA\cos\theta$$

$$\Phi_{\text{enc}} = EA = \frac{Q_{\text{in}}}{\epsilon_0}$$

Conductors

$$E_{\text{surface}} = \frac{\eta}{\epsilon_0}$$

Extra

$$\int \frac{1}{(a^2+b^2)^{\frac{3}{2}}} da = \frac{a}{b^2\sqrt{a^2+b^2}} + C$$

$$E_{\text{ring}} = \frac{kzQ}{(z^2+r^2)^{\frac{3}{2}}}$$

$$E_{\text{disk}} = \frac{-2Qkz}{R^2}\Big(\frac{1}{\sqrt{z^2+R^2}} - \frac{1}{z}\Big)$$

$$W = -q\Delta V$$

$$\Delta V = -Ed$$

$$V_{\text{sphere}} = \frac{4}{3}\pi r^3$$

$$A_{\text{sphere}} = 4\pi r^2$$

$$V_{\text{cylinder}} = \pi r^2 h$$