Charged Spherical Insulator
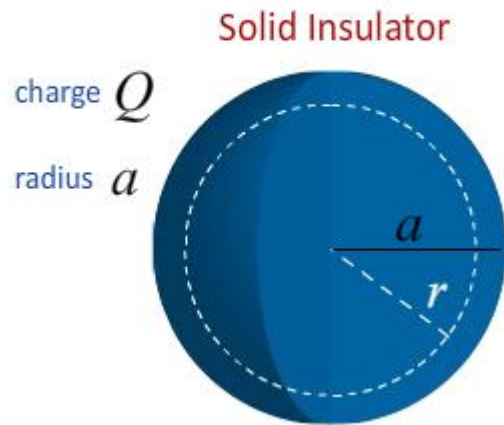
Solid Insulator

charge Q

radius a

a

r

$$V(r) = -\int_{\infty}^{r} \vec{E} \cdot d\vec{l} \qquad \text{For } r < a$$

$$V(r) = -\int_{\infty}^{a} E \, dr - \int_{a}^{r} E \, dr$$

$$V(r) = -\int_{\infty}^{a} k \frac{Q}{r^2} \, dr - \int_{a}^{r} k \frac{Q}{a^3} r \, dr$$