

Electric Field of Uniformly Charged Solid Sphere



- Radius of charged solid sphere: R

- Electric charge on sphere:

$$Q = \rho V = \frac{4\pi}{3} \rho R^3.$$

- Use a concentric Gaussian sphere of radius r .

- $r > R$: $E(4\pi r^2) = \frac{Q}{\epsilon_0}$
 $\Rightarrow E = \frac{1}{4\pi\epsilon_0} \frac{Q}{r^2}$

- $r < R$: $E(4\pi r^2) = \frac{1}{\epsilon_0} \left(\frac{4\pi}{3} r^3 \rho \right)$
 $\Rightarrow E(r) = \frac{\rho}{3\epsilon_0} r = \frac{1}{4\pi\epsilon_0} \frac{Q}{R^3} r$

