

63. We imagine moving all the charges on the surface of the sphere to the center of the sphere. Using Gauss' law, we see that this would not change the electric field *outside* the sphere. The magnitude of the electric field E of the uniformly charged sphere as a function of r , the distance from the center of the sphere, is thus given by $E(r) = q/(4\pi\epsilon_0 r^2)$ for $r > R$. Here R is the radius of the sphere. Thus, the potential V at the surface of the sphere (where $r = R$) is given by

$$\begin{aligned} V(R) &= V\Big|_{r=\infty} + \int_R^\infty E(r) dr = \int_\infty^R \frac{q}{4\pi\epsilon_0 r^2} dr = \frac{q}{4\pi\epsilon_0 R} \\ &= \frac{\left(8.99 \times 10^9 \frac{\text{N}\cdot\text{m}^2}{\text{C}^2}\right) (1.50 \times 10^8 \text{ C})}{0.160 \text{ m}} = 8.43 \times 10^2 \text{ V} . \end{aligned}$$