

Physics 102Rec
Quiz#6
Chapter 24

Name: _____ Id#: _____ Sect#: _____

A positive charge of $+q$ is at the center of a conducting spherical shell whose inner radius is 4 cm and outer radius is 6 cm. The conducting shell carries a net charge of $-8q$, where $q = 1 \mu\text{C}$. Find

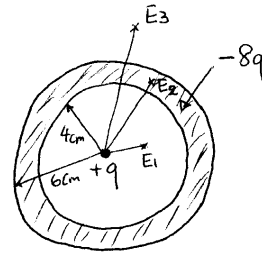
(a) The electric field at $r = 2$ cm, $r = 5$ cm and $r = 10$ cm from the center of the spherical shell.

at $r = 2$ cm

$$E_1 = \frac{kq}{r^2} = \frac{(9 \times 10^9)(1 \times 10^{-9})}{(0.02)^2} = 2.25 \times 10^4 \frac{\text{N}}{\text{C}}$$

at $r = 5$ cm (inside the shell)

$E_2 = 0$ (It is inside a conductor)



at $r = 10$ cm

$$E_3 = \frac{k(q-8q)}{r^2} = \frac{-(9 \times 10^9)(7 \times 10^{-9})}{(0.1)^2} = \underline{\underline{-6300 \frac{\text{N}}{\text{C}}}}$$

↑
inward

(b) The electric flux through a spherical surface of radius $r = 12$ cm.

$$\Phi = \frac{q_{\text{enc}}}{\epsilon_0} = \frac{q-8q}{\epsilon_0} = -\frac{7q}{\epsilon_0} = -791 \frac{\text{N} \cdot \text{m}^2}{\text{C}}$$

(c) The charge on the inner and outer surfaces of the spherical shell.

$$q_{\text{inner}} = -q$$

$$q_{\text{outer}} = -7q$$