



$$\vec{E} = 5000 \text{ r}^2 \hat{r} \frac{\text{N}}{\text{C}}$$

a.) For $r = 20 \text{ cm}$:

$$|\vec{E}| = \underline{200 \text{ N/m}}$$

b.) For $r = 40 \text{ cm}$ sphere:

$$\begin{aligned} \Phi_e &= \oint \vec{E} \cdot d\vec{A} = \oint E dA && \text{since } E \parallel dA \\ & && \text{everywhere} \\ &= E \oint dA && E = \text{const at a} \\ &= E 4\pi r^2 && \text{given } r \end{aligned}$$

$$\begin{aligned} \text{So } \Phi_e &= (5000 \text{ r}^2) 4\pi r^2 \\ &= 4\pi (5000 \text{ r}^4) && \text{for } r = 20 \text{ cm} \\ &= \underline{100.5 \text{ N/C}} \end{aligned}$$

c.) Gauss' Law:

$$\begin{aligned} \frac{\Phi_e}{\epsilon_0} &= \frac{Q_{in}}{\epsilon_0} \Rightarrow Q_{in} = \epsilon_0 \Phi_e \\ &= 8.897 \times 10^{-10} \text{ C} \\ &= \underline{0.8897 \text{ nC}} \end{aligned}$$