

36. (a) Since  $r_1 = 10.0 \text{ cm} < r = 12.0 \text{ cm} < r_2 = 15.0 \text{ cm}$ ,

$$E(r) = \frac{1}{4\pi\epsilon_0} \frac{q_1}{r^2} = \frac{(8.99 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2)(4.00 \times 10^{-8} \text{ C})}{(0.120 \text{ m})^2} = 2.50 \times 10^4 \text{ N/C} .$$

(b) Since  $r_1 < r_2 < r = 20.0 \text{ cm}$ ,

$$\begin{aligned} E(r) &= \frac{1}{4\pi\epsilon_0} \frac{q_1 + q_2}{r^2} = \frac{(8.99 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2)(4.00 + 2.00)(1 \times 10^{-8} \text{ C})}{(0.200 \text{ m})^2} \\ &= 1.35 \times 10^4 \text{ N/C} . \end{aligned}$$