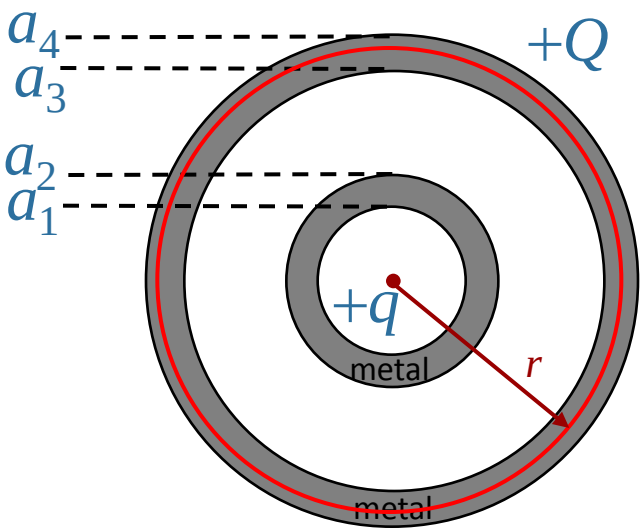
Calculation: Quantitative Analysis

cross-section



$a_3 < r < a_4$: What is $E(r)$ Inside outer metal sphere?

A) 0 B) $\frac{1}{4\pi\varepsilon_0}\frac{q}{r^2}$ C) $\frac{1}{2\pi\varepsilon_0}\frac{q}{r}$

D) $\frac{1}{4\pi\varepsilon_0}\frac{-q}{r^2}$ E) $\frac{1}{4\pi\varepsilon_0}\frac{Q-q}{r^2}$

Applying Gauss' law, what is $Q_{enclosed}$ for red sphere shown?

A) q B) $-q$ C) 0

How is this possible?

$-q$ must be induced at $r = a_3$ surface → charge at $r = a_4$ surface $= Q + q$

$$\sigma_3 = \frac{-q}{4\pi a_3^2} \qquad \sigma_4 = \frac{Q+q}{4\pi a_4^2}$$