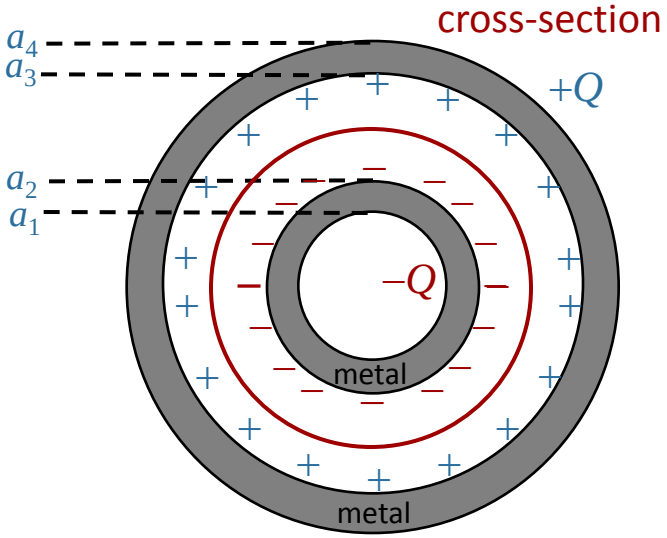
Calculation



A capacitor is constructed from two conducting cylindrical shells of radii a_1, a_2, a_3, and a_4 and length L ($L >> a_i$).

What is the capacitance C of this capacitor ?

$$C \equiv \frac{Q}{V}$$

$a_2 < r < a_3$: What is $E(r)$?

A) 0

B) $\frac{1}{4\pi\varepsilon_o}\frac{Q}{r^2}$

C) $\frac{1}{2\pi\varepsilon_o}\frac{Q}{Lr}$

D) $\frac{1}{2\pi\varepsilon_o}\frac{2Q}{Lr}$

E) $\frac{1}{4\pi\varepsilon_o}\frac{2Q}{r^2}$

Why?

Gauss' law: $\int \vec{E}\cdot d\vec{A} = \frac{Q_{enclosed}}{\varepsilon_o} \rightarrow E\cdot 2\pi r L = \frac{Q}{\varepsilon_o} \rightarrow E = \frac{1}{2\pi\varepsilon_o}\frac{Q}{Lr}$

Direction: Radially In