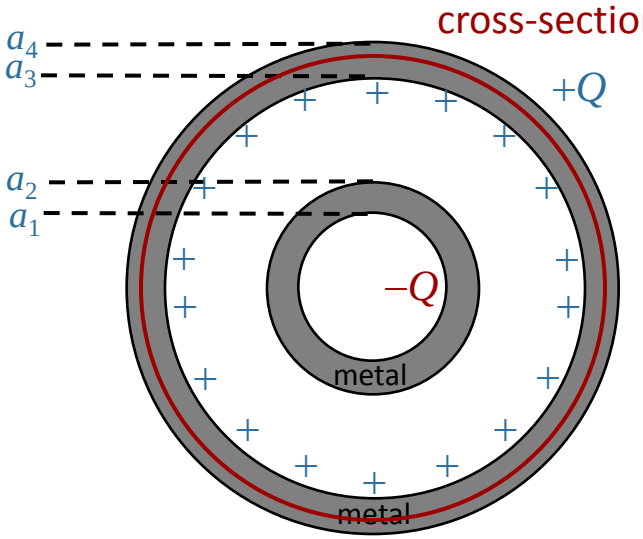
Calculation



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 ?

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

Where is $+Q$ on outer conductor located?

A) at $r = a_4$ B) at $r = a_3$ C) both surfaces D) throughout shell

Why?

Gauss' law: $\int \vec{E} \cdot d\vec{A} = \frac{Q_{enclosed}}{\varepsilon_o}$ → $Q_{enclosed} = 0$

We know that $E = 0$ in conductor (between a_3 and a_4)

$Q_{enclosed} = 0$ → $+Q$ must be on inside surface (a_3), so that $Q_{enclosed} = +Q - Q = 0$