Calculation

cross-section
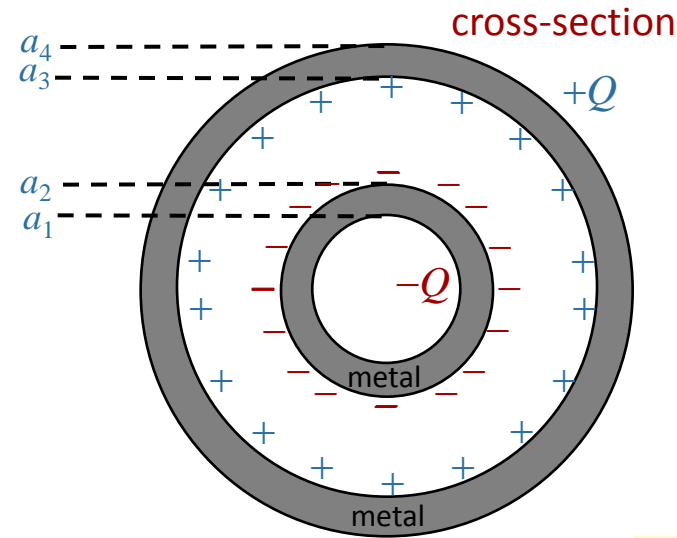
a_4 ----
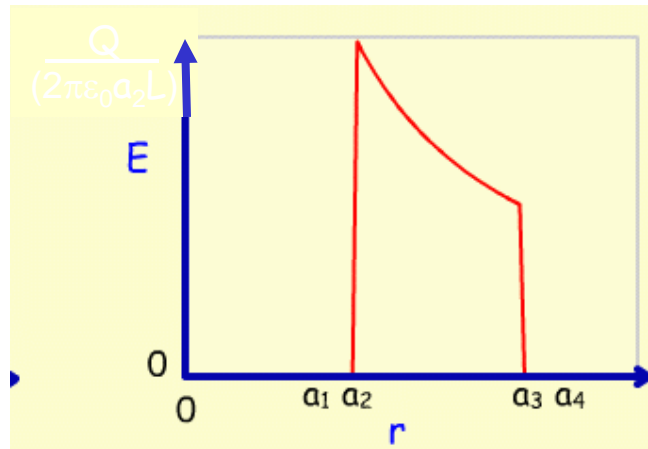
a_3 ----

$+Q$

a_2 ----

a_1 ----

$-Q$

metal

metal

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

What is the capacitance C of this capacitor?

$$C \equiv \frac{Q}{V} \qquad a_2 < r < a_3: \quad E = \frac{1}{2\pi\varepsilon_0} \frac{Q}{Lr}$$

$r < a_2: \quad E(r) = 0$

since $Q_{enclosed} = 0$

$\frac{Q}{(2\pi\varepsilon_0 a_2 L)}$

E

0

0   a_1 a_2 a_3 a_4

r

What is V?

The potential difference between the conductors.

What is the sign of $V = V_{outer} - V_{inner}$?

A) $V_{outer} - V_{inner} < 0$ B) $V_{outer} - V_{inner} = 0$ C) $V_{outer} - V_{inner} > 0$