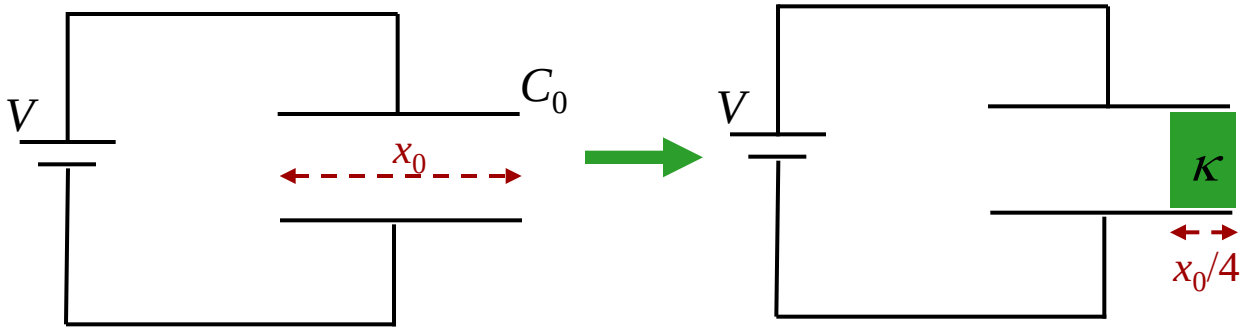
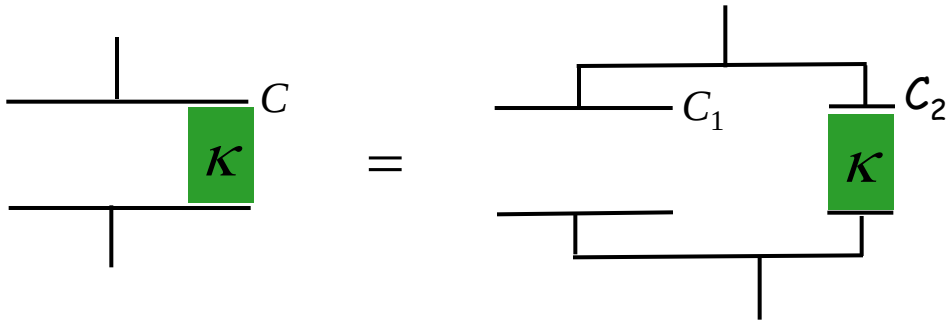
Calculation



An air-gap capacitor, having capacitance C_0 and width x_0 is connected to a battery of voltage V.

A dielectric (κ) of width $x_0/4$ is inserted into the gap as shown.

What is Q_f, the final charge on the capacitor?



$C_1 = {}^3/_4 C_0$ $\quad$ $C_2 = {}^1/_4\ \kappa C_0$

What is C?

A) $C = C_1 + C_2$ $\quad$ B) $C = C_1 + \kappa C_2$ $\quad$ C) $C = \left(\dfrac{1}{C_1} + \dfrac{1}{C_2} \right)^{-1}$

C = parallel combination of C_1 and C_2: $\quad C = C_1 + C_2$

$$\rightarrow \quad C = C_0 \left({}^3/_4 + {}^1/_4\ \kappa \right)$$