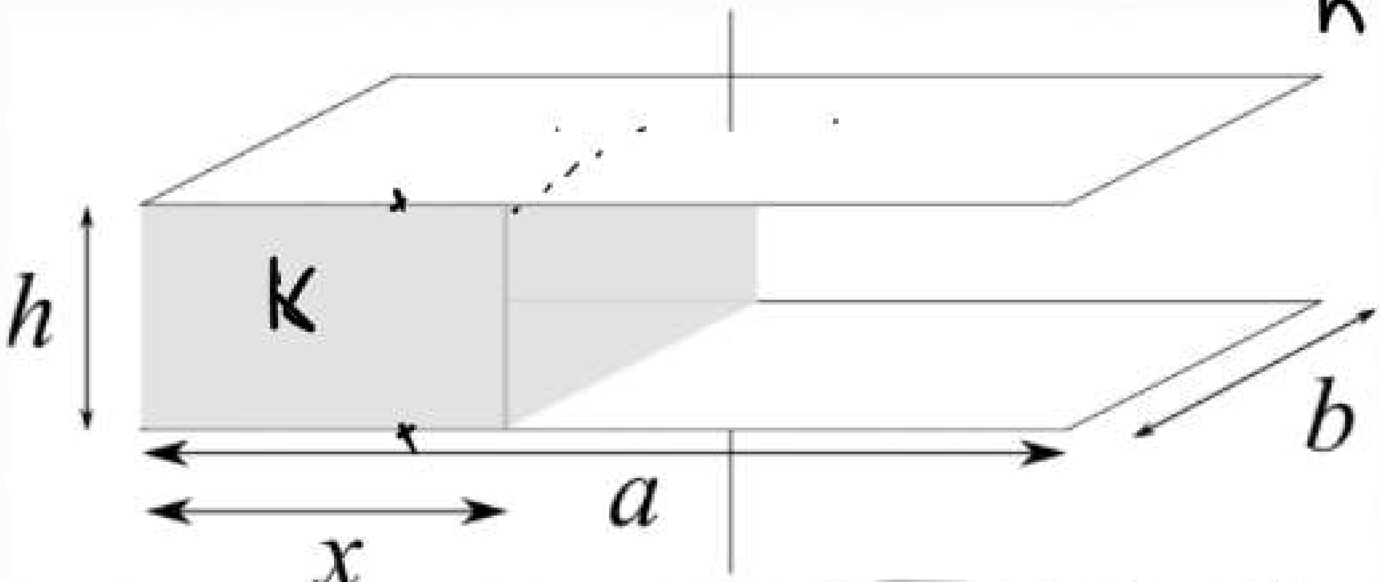
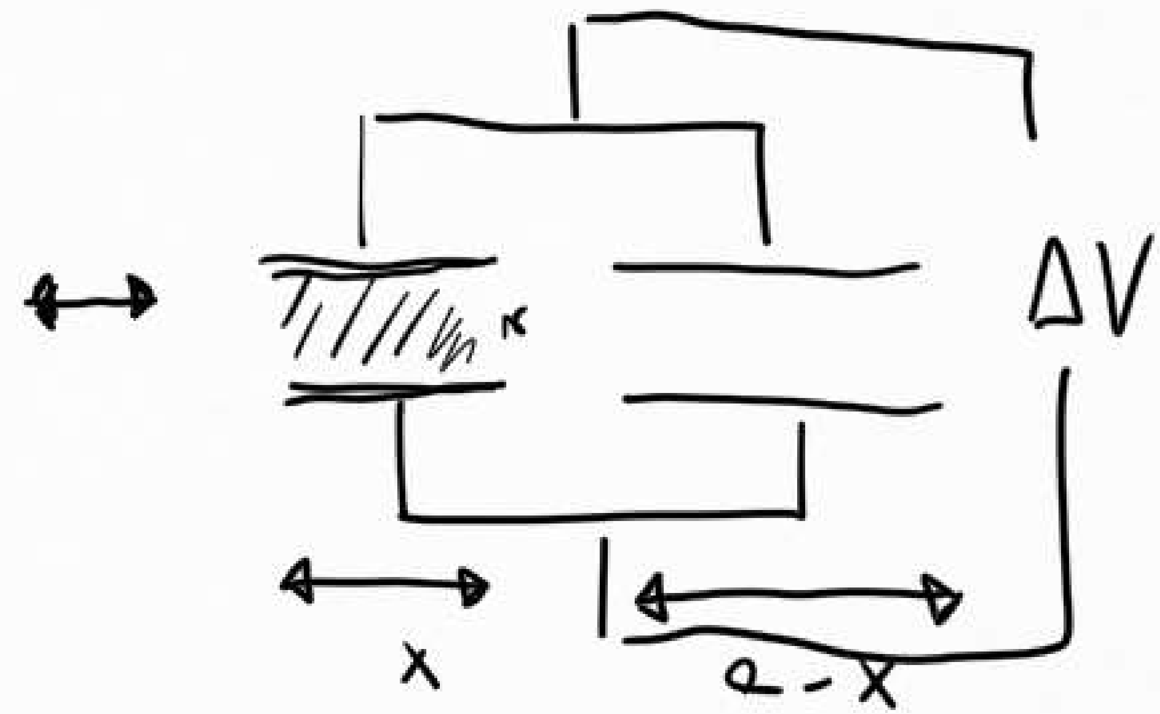
$$C = \frac{\varepsilon_0 \Sigma}{h}$$

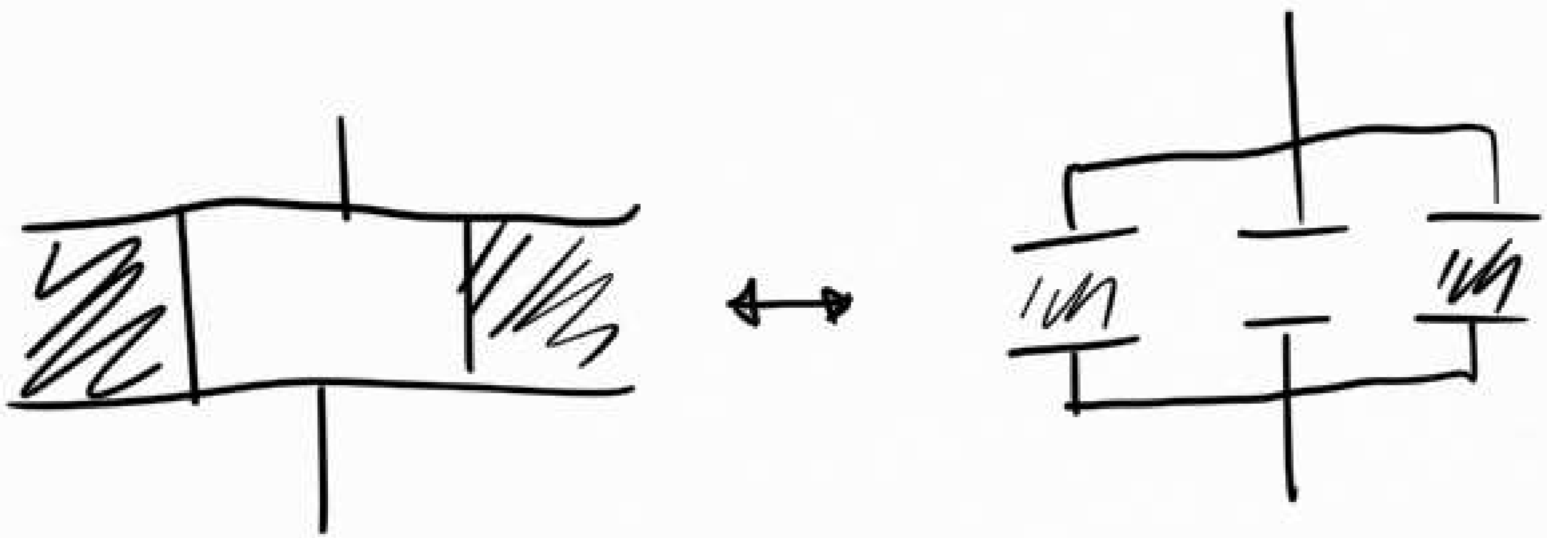


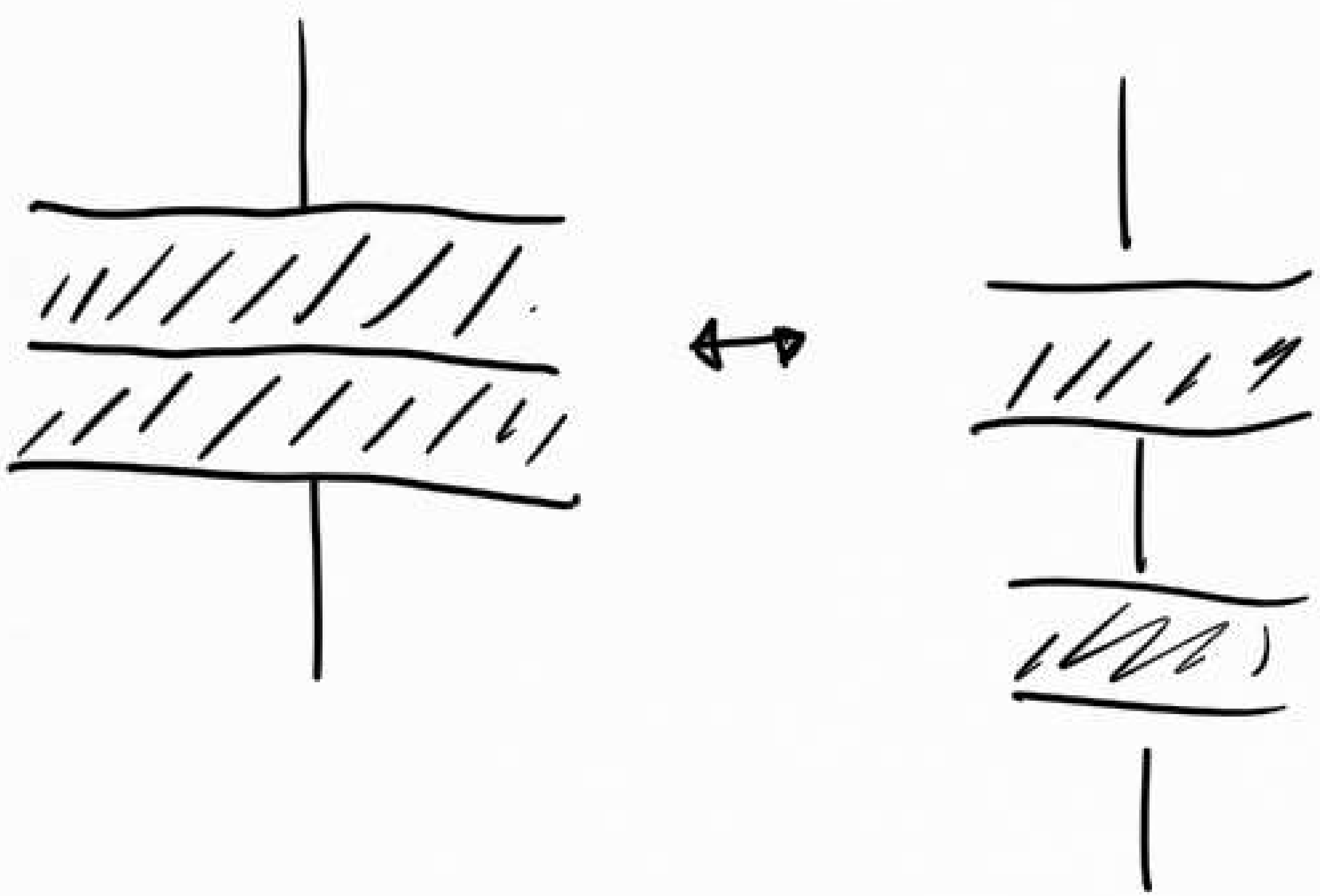


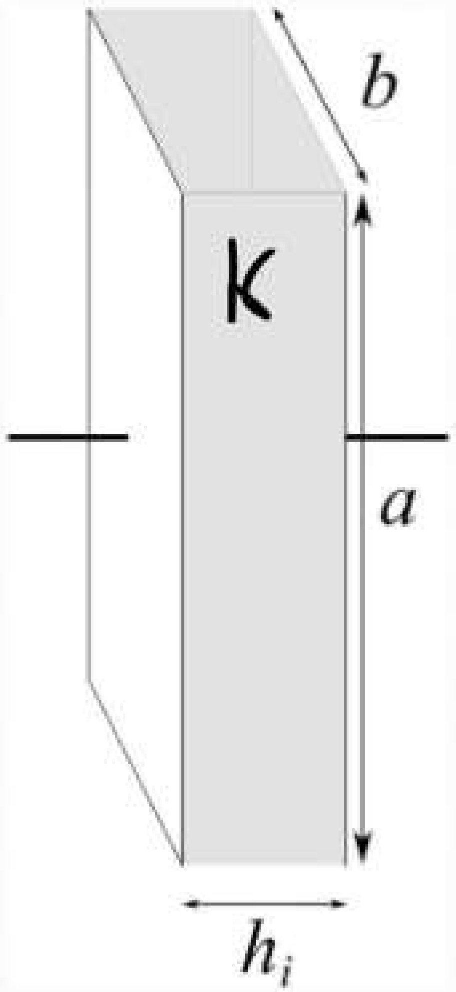
$$\boxed{q = C\Delta V = q_d + q_v}$$

$$\Delta V = E_d h = \frac{\sigma_d h}{\kappa \varepsilon_0} = \frac{q_d}{x b}\,\frac{h}{\kappa \varepsilon_0} = q_d \frac{h}{x b \kappa \varepsilon_0} = \frac{q_d}{C_d}$$

$$\Delta V = E_v h = q_v \frac{h}{(a-x) b \varepsilon_0} = \frac{q_v}{C_v} \Rightarrow C\Delta V = (C_d + C_v)\,\Delta V$$



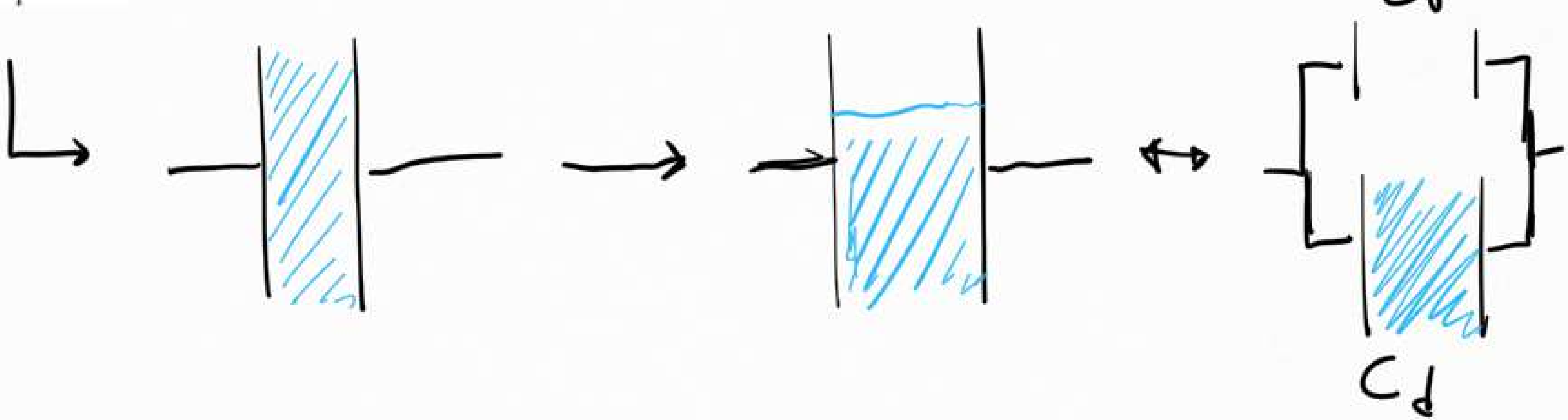




$\Delta V = \text{cost}$, $h_i \to h_f = \frac{3}{2} h_i$

1) C_f , $C_f - C_i$

2) cosa cambia se prima di cambiare h stacco il generatore

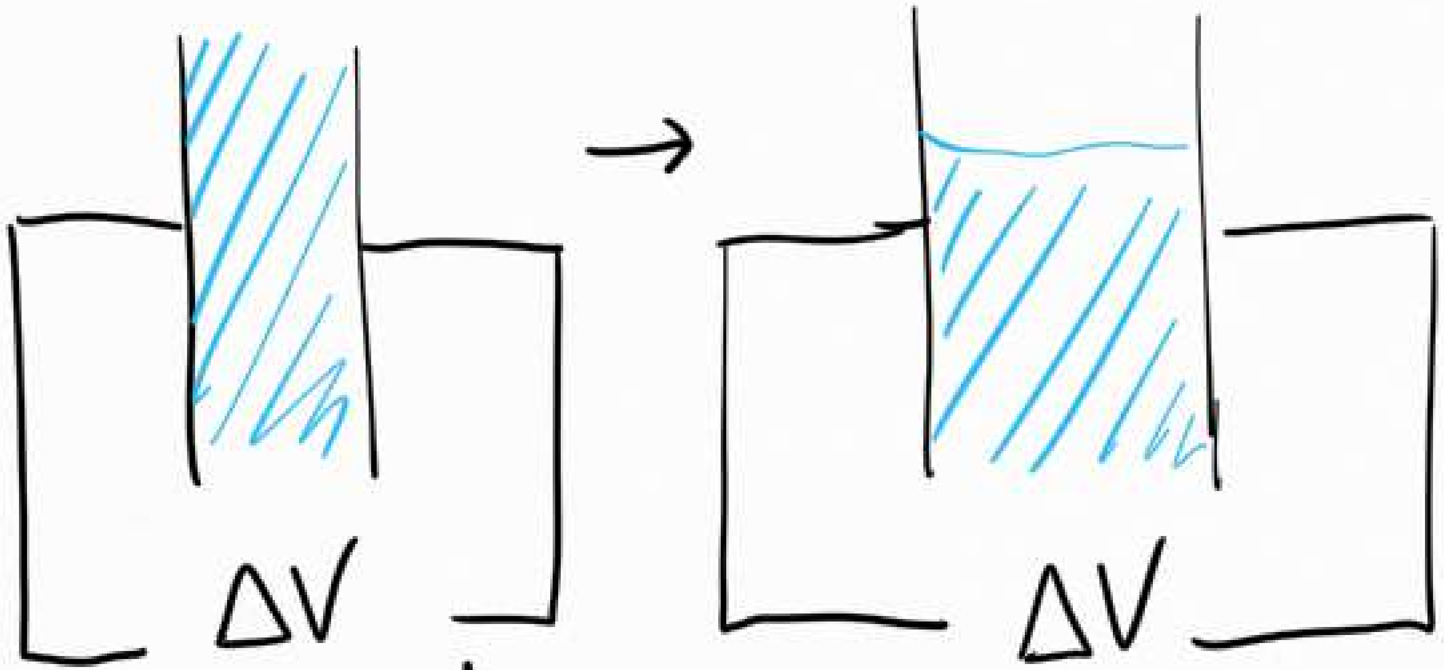


$$C_f = C_d + C_v \quad , \quad V_i = abh_i \quad , \quad V_f = \frac{3}{2} abh_i$$

$$C_d = \frac{k \Sigma_d \varepsilon_0}{\frac{3}{2} h_i} \quad , \quad \Sigma_d = \frac{abh_i}{\frac{3}{2} h_i} = \frac{2}{3} ab \Rightarrow$$

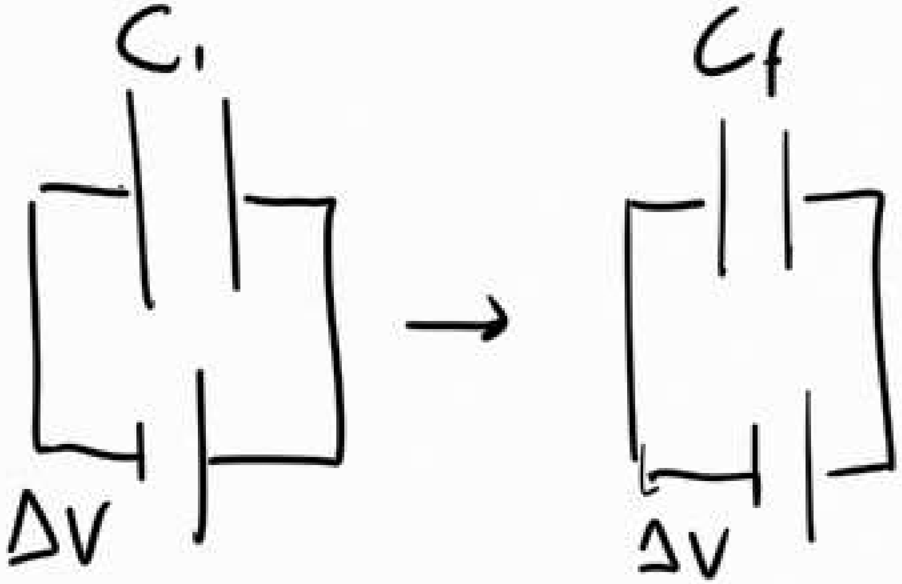
$$C_d = \frac{4}{9} k \frac{ab \varepsilon_0}{h_i} \quad , \quad C_v = \frac{\Sigma_v \varepsilon_0}{\frac{3}{2} h_i} = \frac{2}{9} \frac{ab \varepsilon_0}{h_i}$$

$$C_f = C_d + C_v$$



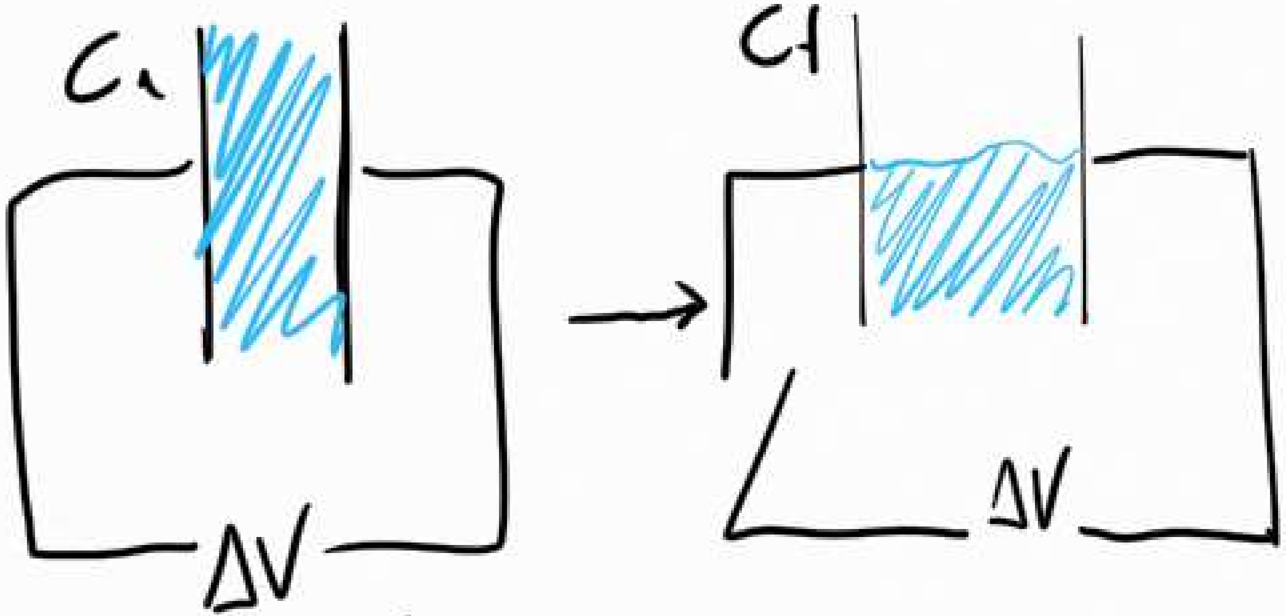
I $\Delta V = \text{cost}$

$$E_i = \frac{\sigma}{\kappa \varepsilon_0} \quad , \quad E_f = ?$$

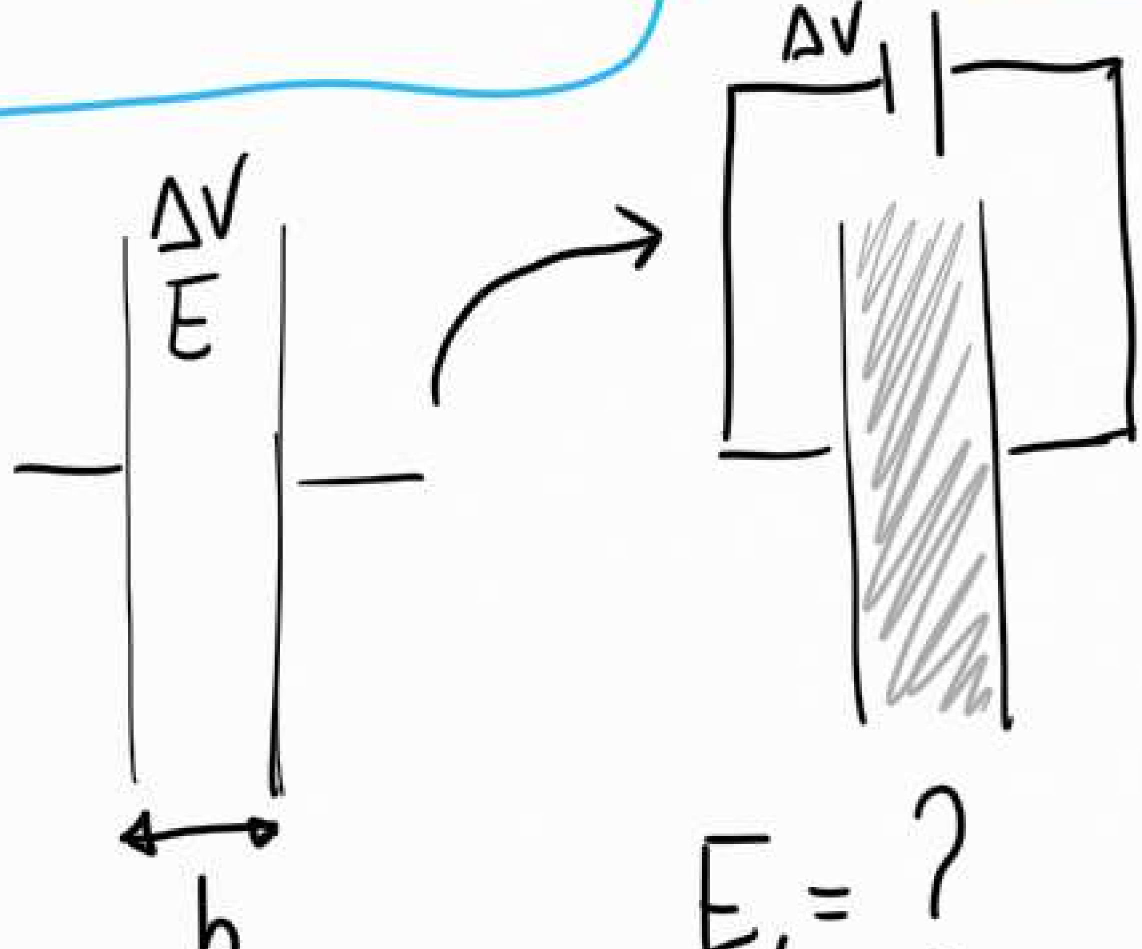


$$q = C\,\Delta V$$

$$q_f \neq q_i$$



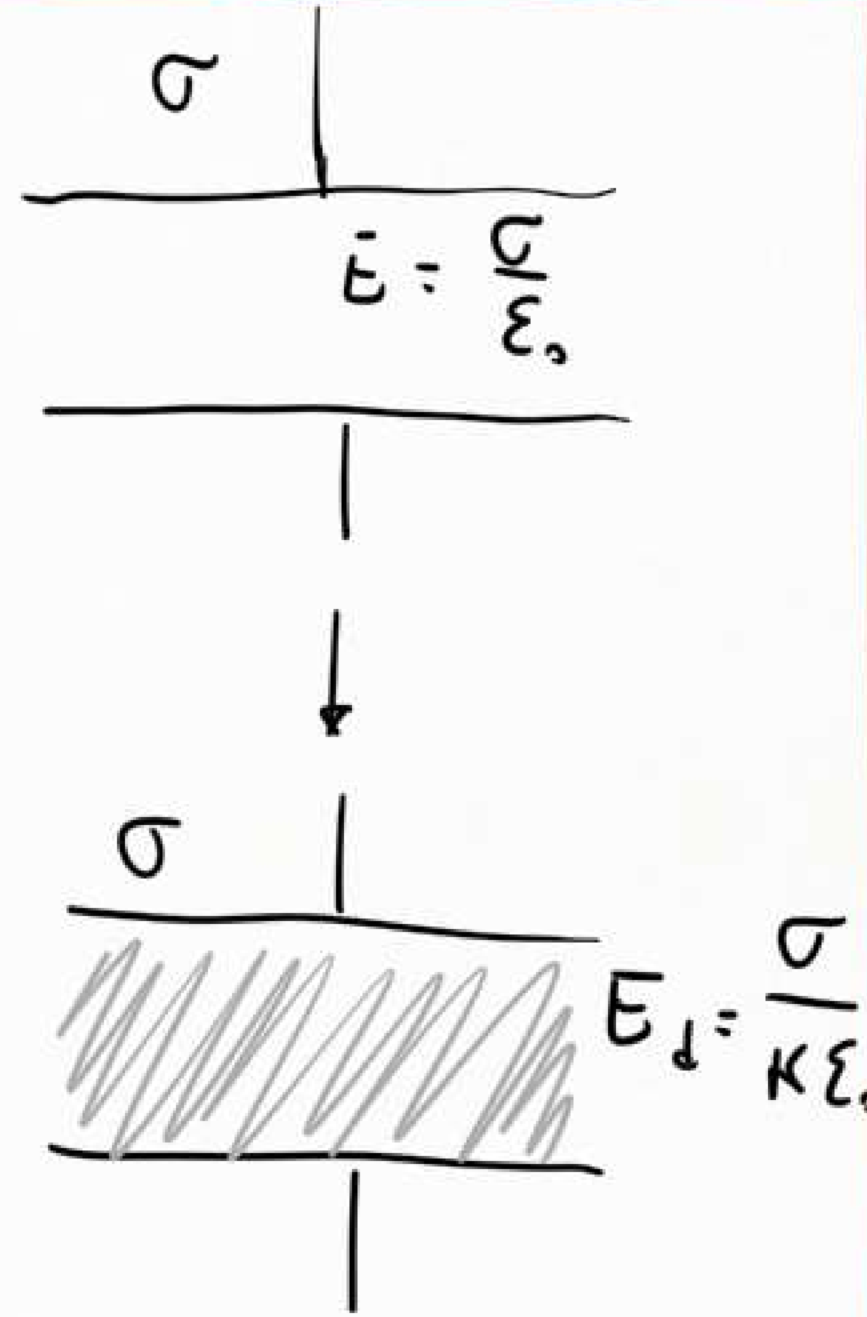
$$q = C\,\Delta V \,, \quad q_i = q_f \Rightarrow \Delta V = \frac{q_i}{C_i} \rightarrow \Delta V_f = \frac{q_i}{C_f}$$

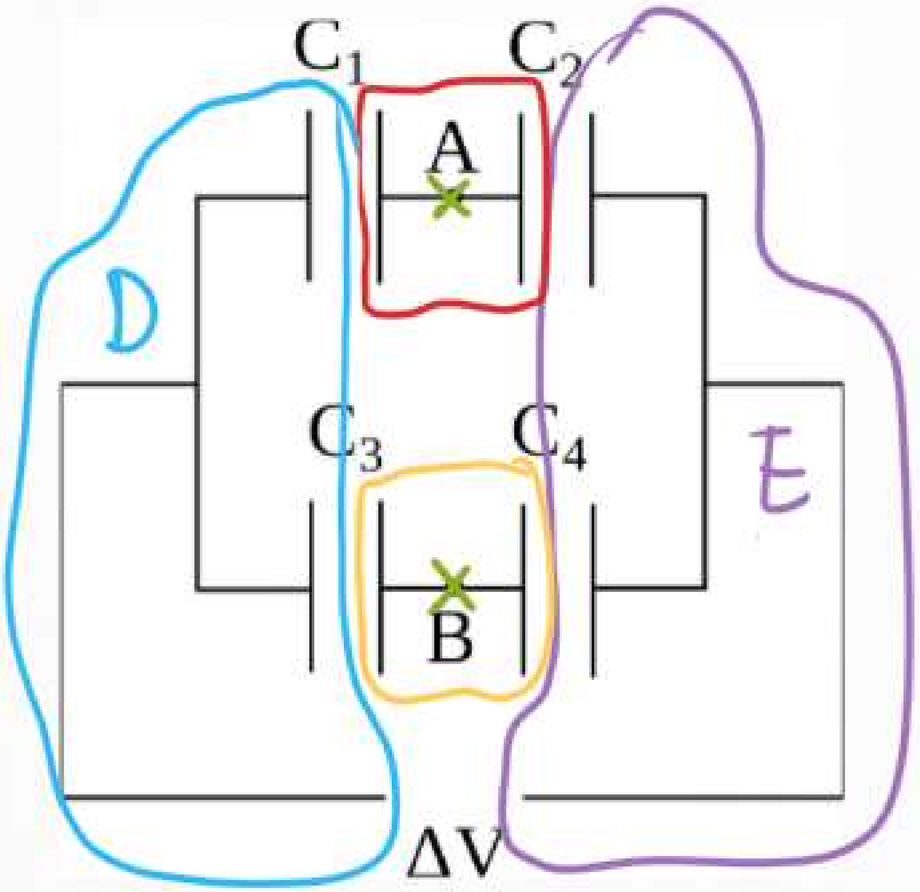


$$E = \frac{\Delta V}{h}$$

$$E_f = ?$$

$$E_f = E_i$$



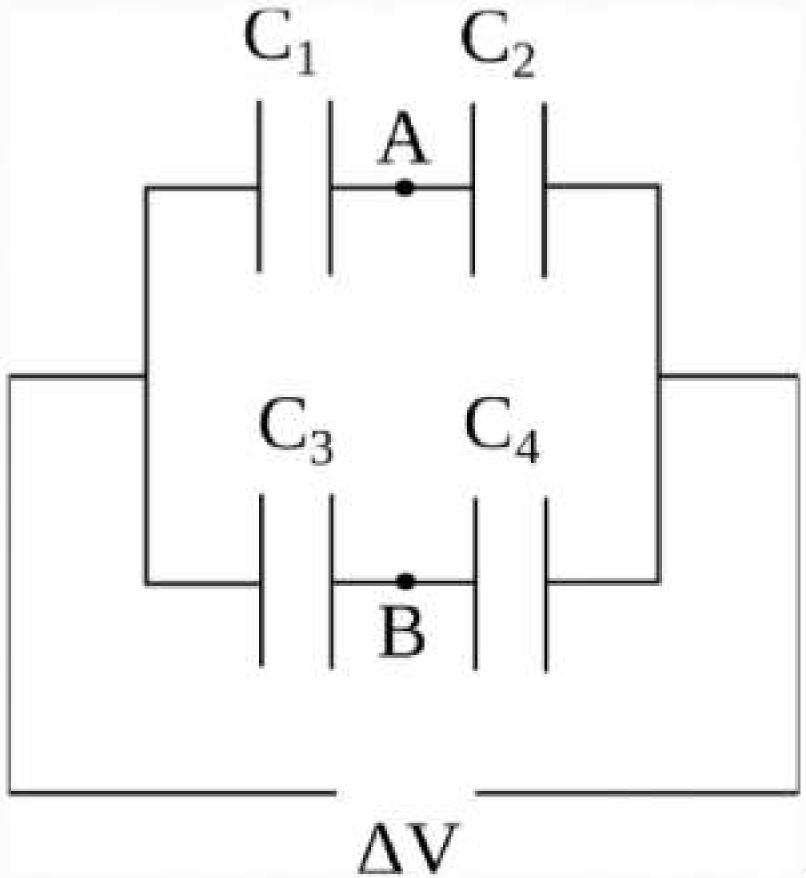


$$C_1, C_2, C_3, C_4 : \quad \underbrace{V_A - V_B = \Delta V_{AB} = 0}$$

$$V_A - V_B = 0 \Rightarrow V_A = V_B$$

$$\Delta V = V_D - V_E = V_D - V_A + V_A - V_E = \Delta V_1 + \Delta V_2 =$$
$$= \Delta V_3 + \Delta V_4$$

$$\Delta V_1 = \Delta V_3 , \quad \Delta V_2 = \Delta V_4$$



$$\Delta V_1 = \Delta V - \Delta V_2 = \Delta V - \frac{q_2}{C_2}$$

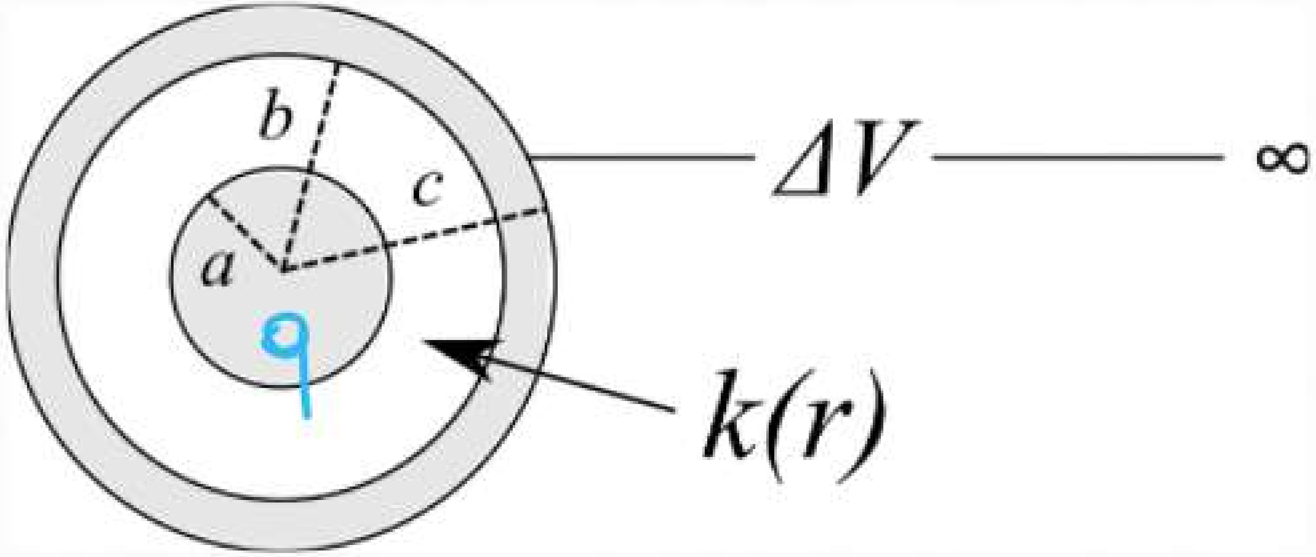
$$q_2 = q_1 = C_{eq}^{U} \Delta V ,$$

$$C_{eq}^{U} = \frac{C_1 C_2}{C_1 + C_2}$$

$$\Delta V_3 = \Delta V - \frac{q_4}{C_4} , \quad q_4 = q_3 = C_{eq}^{D} \Delta V$$

$$C_{eq}^{D} = \frac{C_3 C_4}{C_3 + C_4} , \quad \Delta V_1 = \Delta V_3 \implies \frac{q_2}{C_2} = \frac{q_4}{C_4} \implies$$

$$\frac{C_1}{C_1+C_2} = \frac{C_3}{C_3+C_4} \Leftrightarrow \boxed{C_1 C_4 = C_2 C_3}$$



$a = 20$ cm, $b = 30$ cm

$c = 35$ cm

$k(r) = \frac{r}{a}$, $q = 10$ nC

$\Delta V = 500$ V

1) $q_a, q_b, q_c = ?$

2) $\sigma_{p_1} = ?$

1) $q_a = q$, $q_b = -q$, q_c, $\Delta V = \frac{q_c}{4\pi\varepsilon_0}\frac{1}{c} \Rightarrow$

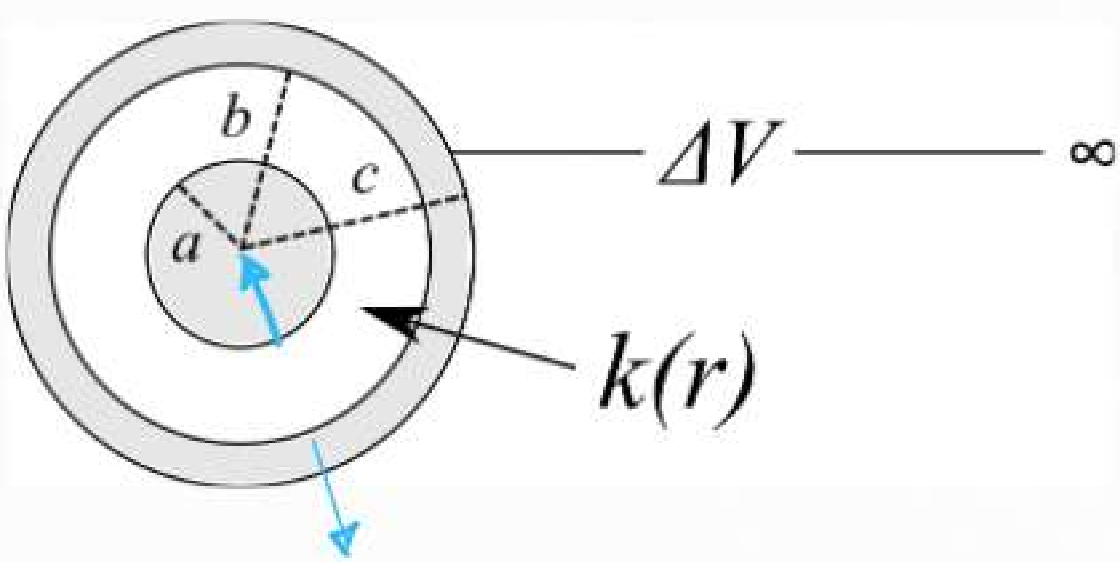
$q_c = \Delta V\, 4\pi\varepsilon_0 c$

$$\sigma_p = \vec{P} \cdot \hat{n} \quad , \quad \vec{P} = \varepsilon_0 (\kappa - 1) \vec{E}$$

$$\vec{E} = \frac{q}{4\pi \varepsilon_0 k(r)} \frac{1}{r^2} \hat{r} \quad , \quad \vec{P} = \frac{(k(r) - 1) q}{4\pi \, k(r) \, r^2} \hat{r} =$$

$$= \frac{\left(\frac{r}{a} - 1\right) q}{4\pi \frac{r}{a} r^2} \hat{r} = \boxed{\frac{(r-a)\, q}{4\pi r^3} \hat{r}}$$

$$\vec{P} \cdot \hat{n}$$



$$\begin{cases} \sigma_p^{(1)} = -\left.\dfrac{(r-a)q}{4\pi r^3}\right|_{r=a} = 0 \\[2ex] \sigma_p^{(2)} = \left.\dfrac{(r-a)q}{4\pi r^3}\right|_{r=b} = \dfrac{(b-a)q}{4\pi b^3} \end{cases}$$