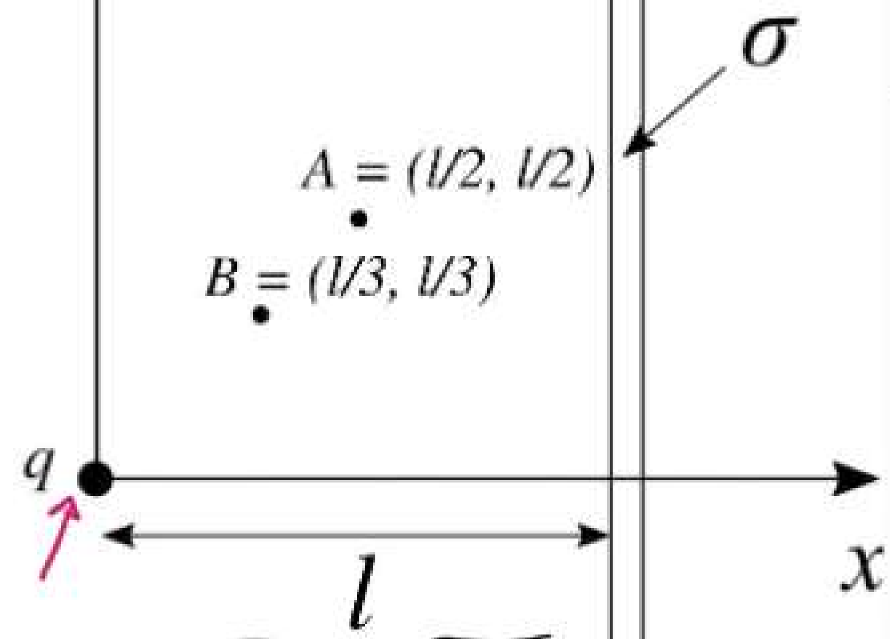
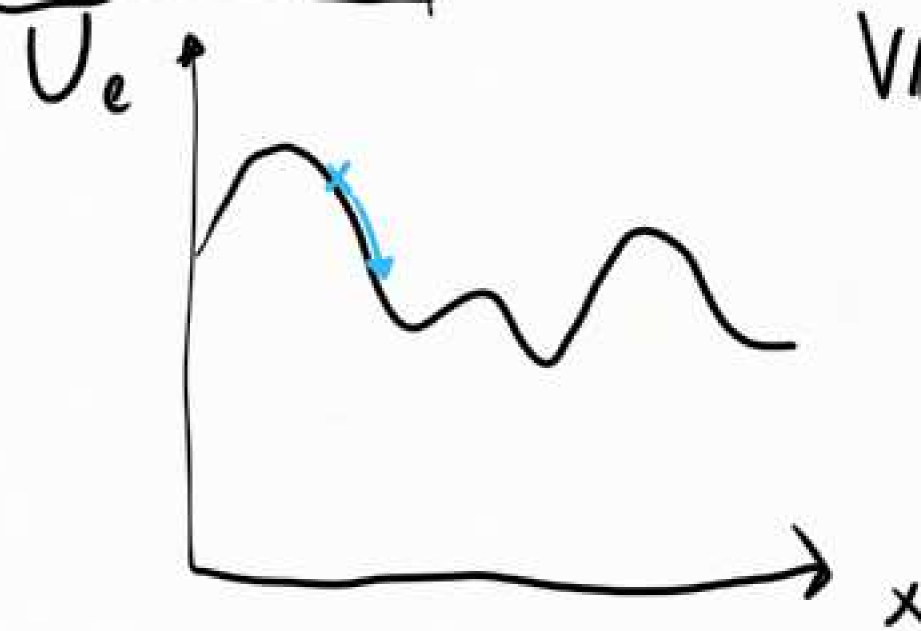
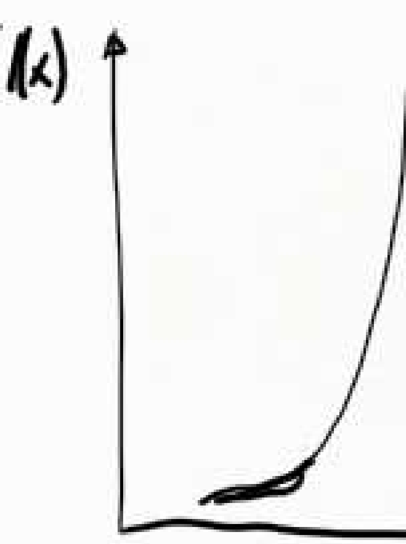


1) $\overline{E}(A) = ?$

3) $V(B) - V($

$$\boxed{U_e = qV}$$





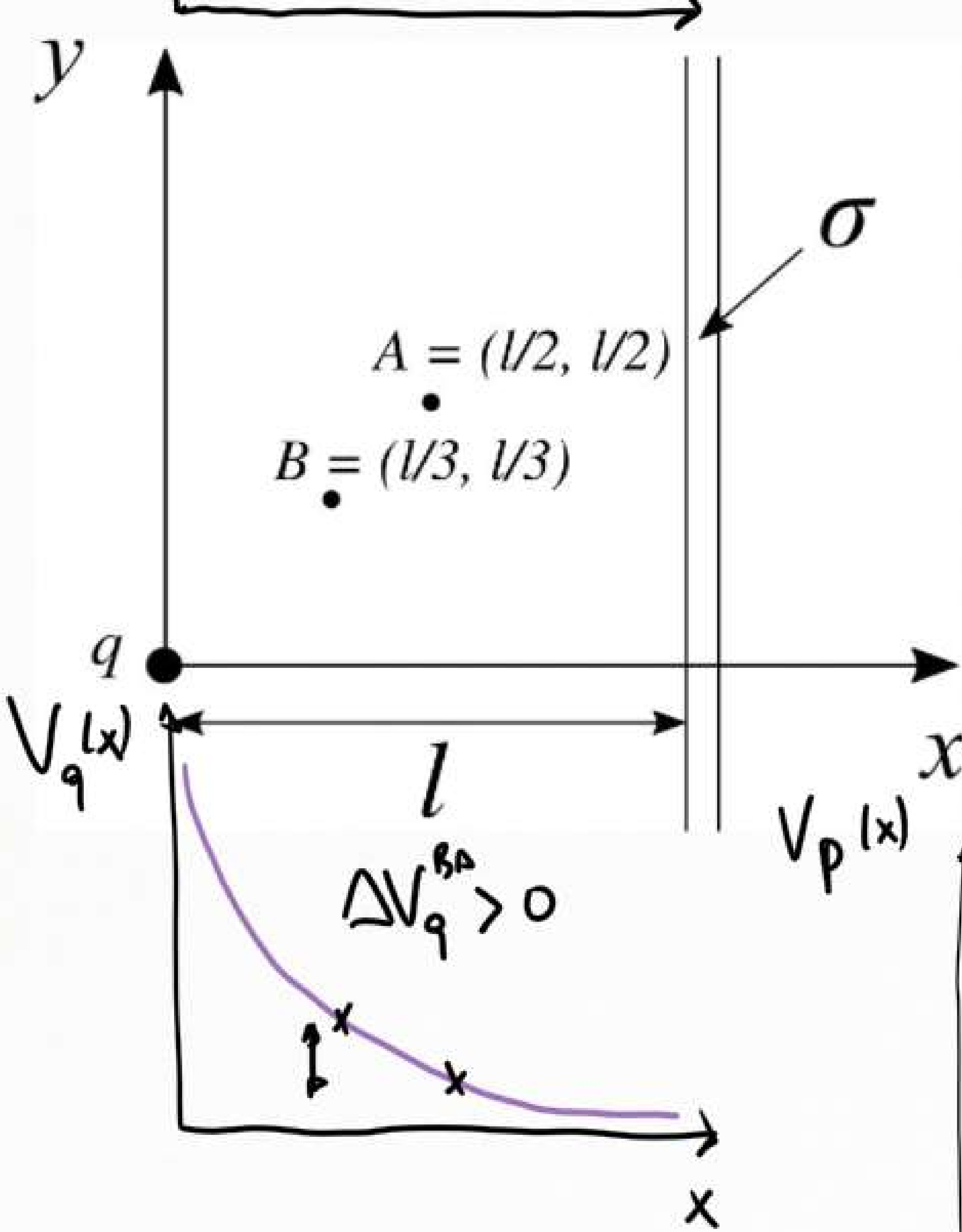
$$V(B) - V(A) =$$

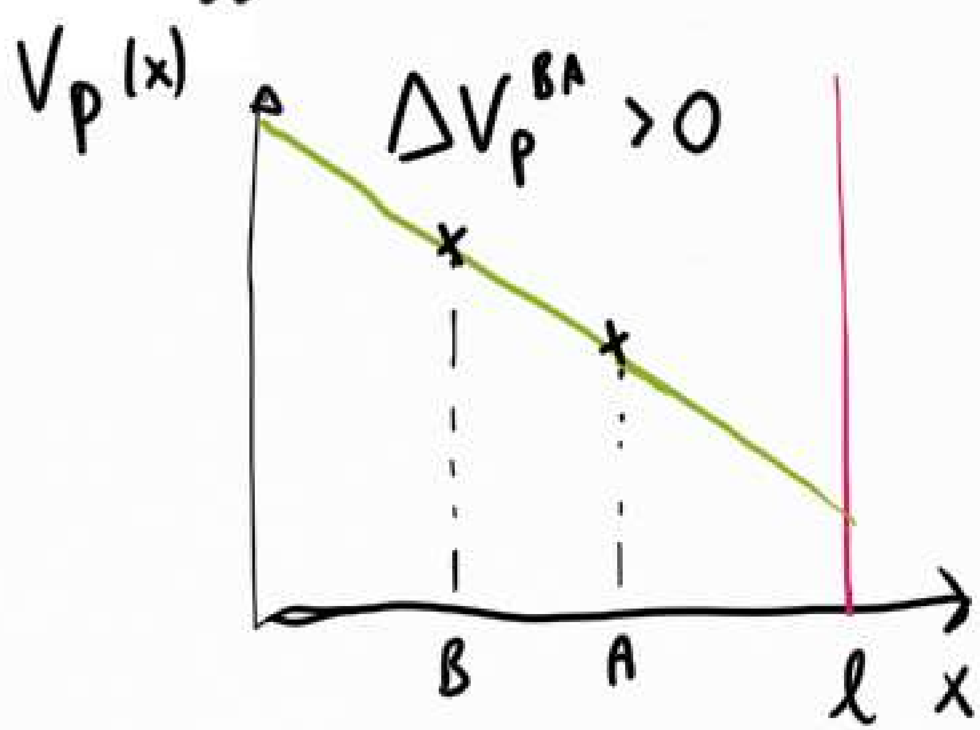
$$V(x) = V_q(x) + V_p(x)$$

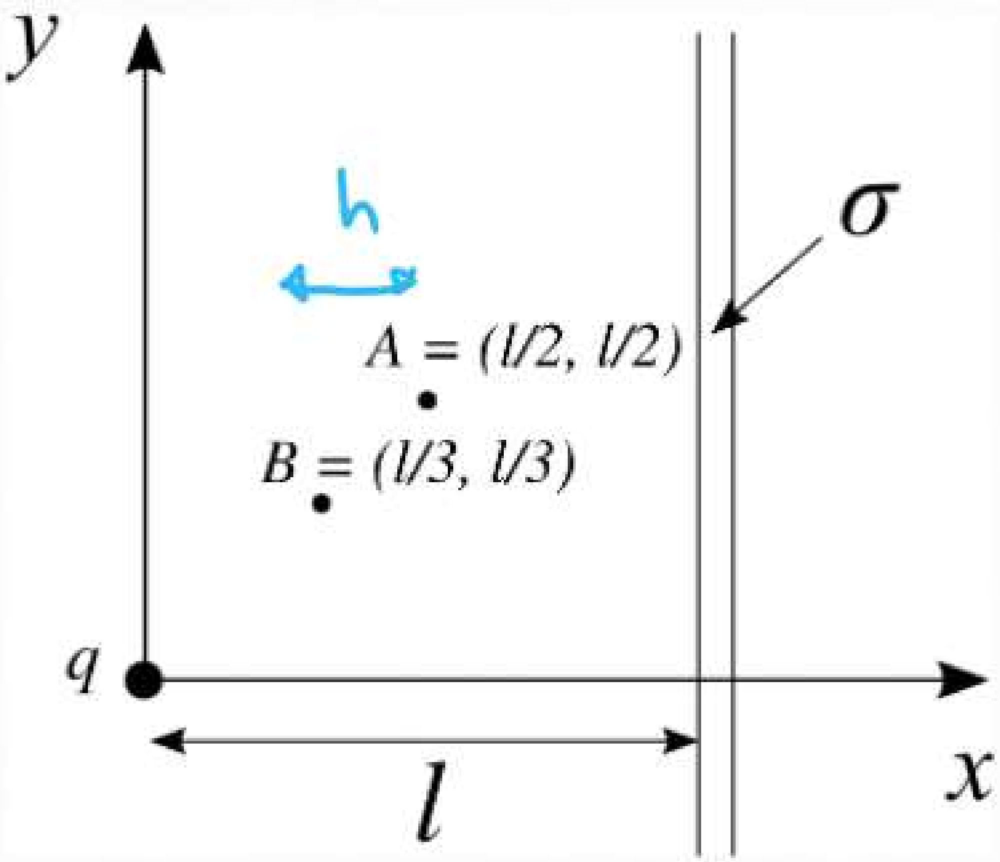
$$\Downarrow$$

$$V_q(B) + V_p(B) - V_q(A) - V_p(A) =$$

$$= \boxed{\Delta V_q^{BA}} + \boxed{\Delta V_p^{BA}} > 0$$



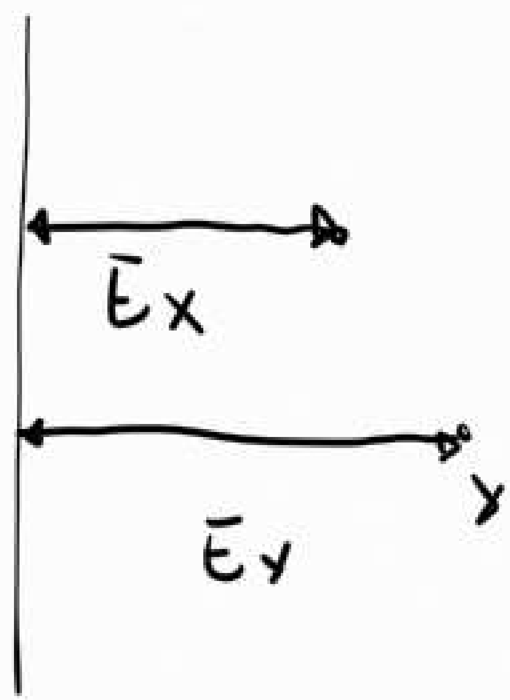


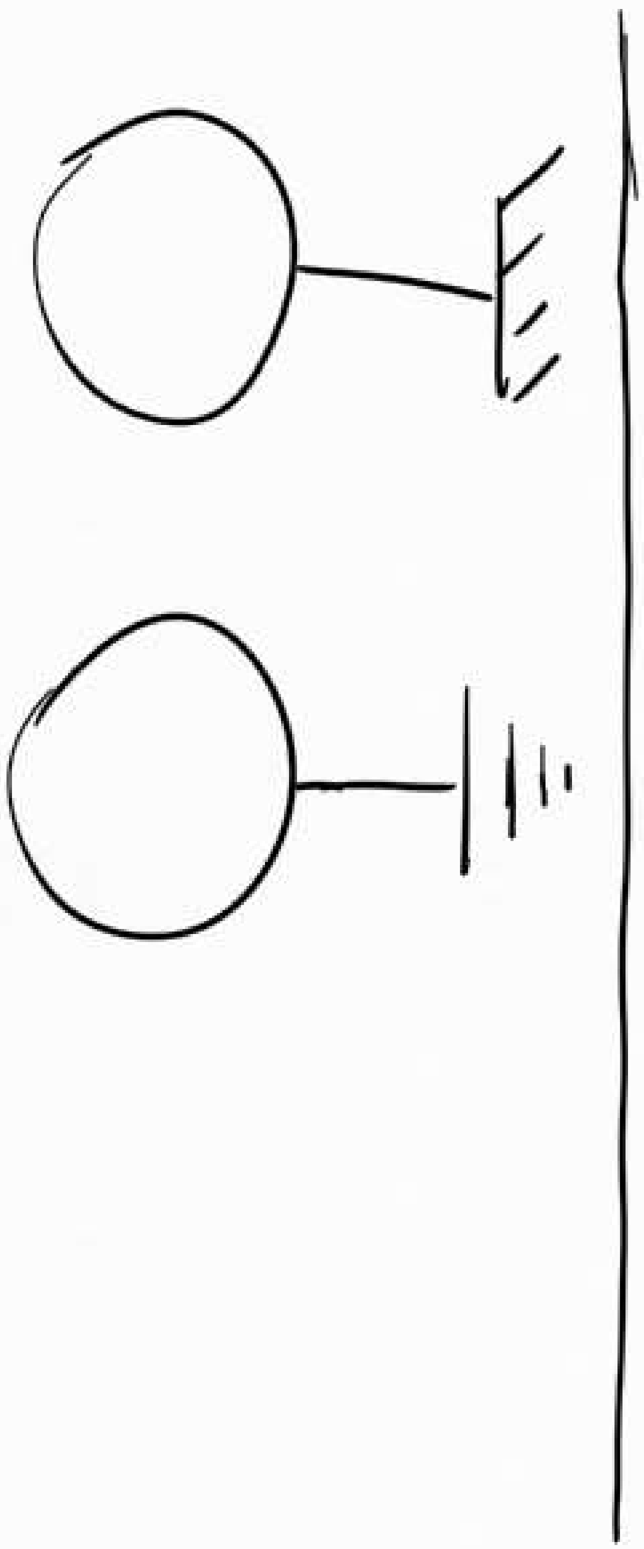


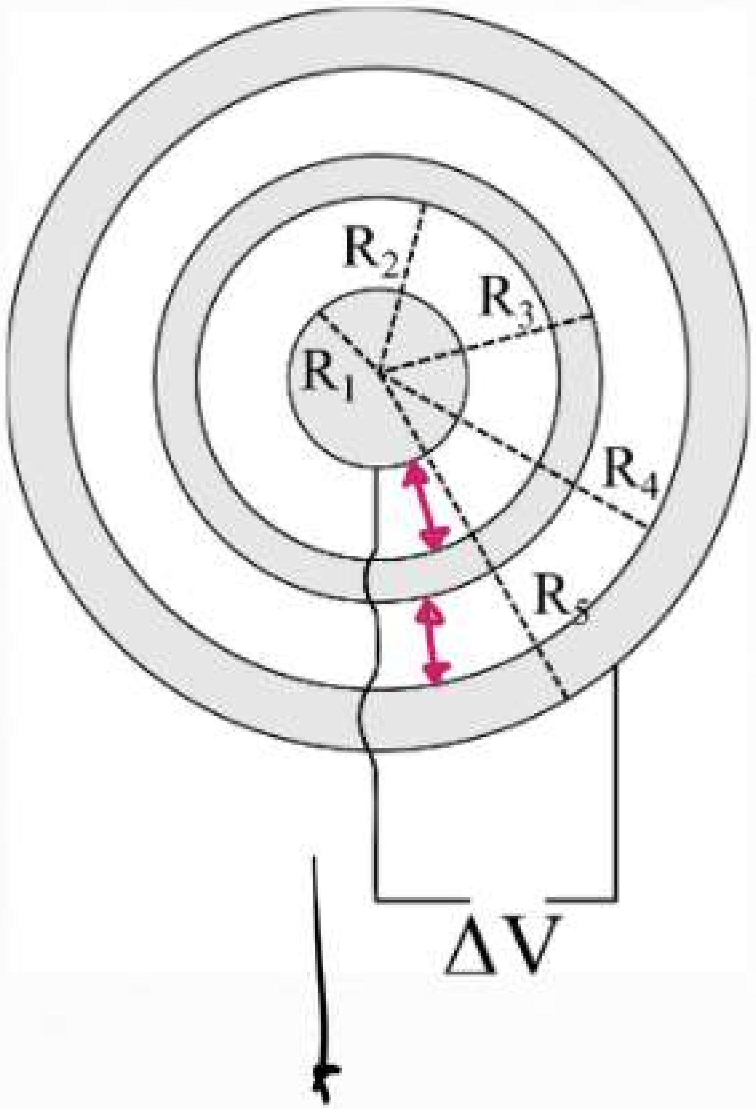
$$\Delta V_p^{BA} = -Eh = -\frac{\sigma}{\varepsilon_0}\left(\frac{l}{2}-\frac{l}{3}\right) > 0$$

$$\Delta V_q^{BA} = \frac{q}{4\pi\varepsilon_0}\left(\frac{1}{r_B}-\frac{1}{r_A}\right)$$

$$r_B = \sqrt{\frac{l^2}{9}}, \quad r_A = \sqrt{\frac{2l^2}{4}}$$







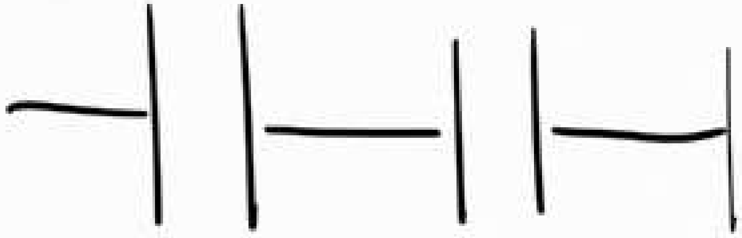
$\Delta V = 10\,V$, $R_1 = 10$ cm, $R_2 = 12$ cm, $R_3 = 15$ cm

$R_4 = 20$ cm, $R_5 = 22$ cm

1) $\lambda_1, \lambda_2, \lambda_3, \lambda_4, \lambda_5$ oppure $\sigma_1, \sigma_2, \sigma_3, \sigma_4, \sigma_5$

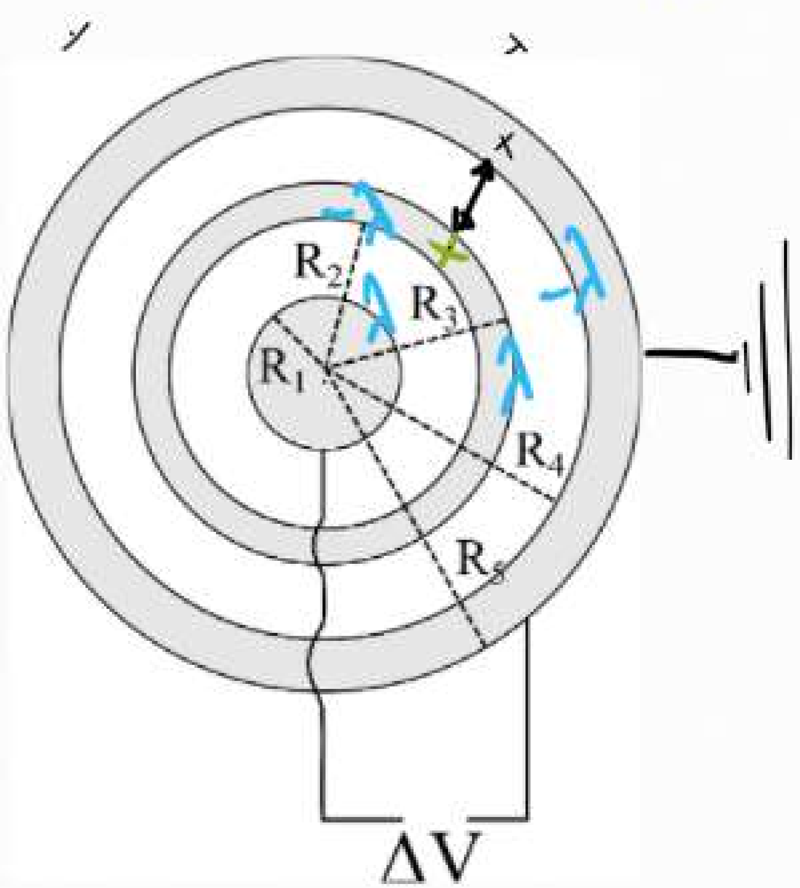
$\lambda_i = \sigma_i \, 2\pi R_i$

2) il conduttore esterno viene messo a terra, $\Delta V_0 = V(R_3) - V(r > R_5)$



$$\boxed{\Delta V = \frac{\lambda}{2\pi\varepsilon_0}\left(\log\frac{R_e}{R_i}\right)}$$

$$\Delta V = \frac{\lambda}{2\pi\varepsilon_0}\left(\log\frac{R_2}{R_1} + \log\frac{R_4}{R_3}\right)$$



$$V(R_5) - V(r > R_5) = \frac{\lambda}{2\pi\varepsilon_0}\log\left(\frac{R_4}{R_3}\right)$$

3.20 MNV $q = 8 \cdot 10^{-9}\,C$, $\rho(r) = br$

1) calcolare b , 2) $E(r)$ 3) $\Delta V = V(0) - V(R)$

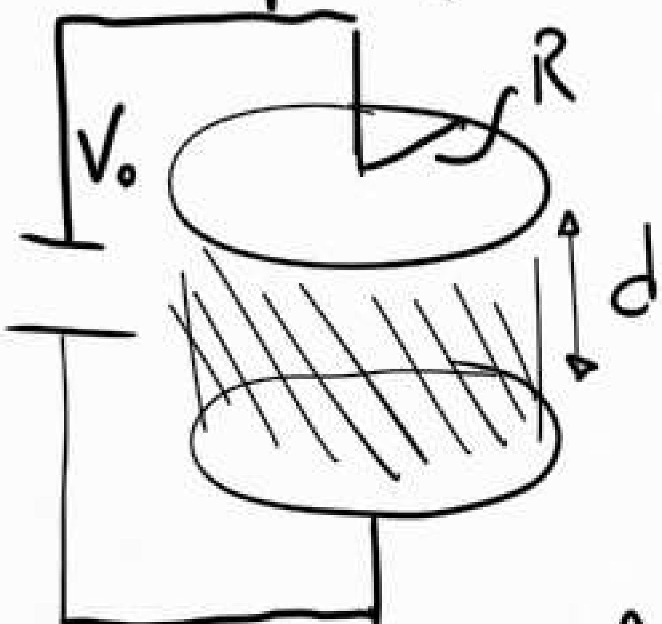
$$q = \int_\tau dq = \int_\tau \rho\, d\tau = \int_\tau b r\, d\tau = \int_0^R b r\, 4\pi r^2 dr =$$

$$= 4\pi b \int_0^R r^3 dr = \pi b R^4 = q \Rightarrow$$

$$b = \frac{q}{\pi R^4}$$

$$\Delta V = -\int_0^R E(r)\, dr$$

4.34 MNV K



1) ΔU_e 2) E 3) P

1) $\Delta U_e = U_e^{(f)} - U_e^{(i)} > 0$

$$\Delta U_e = \frac{1}{2}(K C_0 - C_0) V_0^2 = \frac{1}{2}(K-1) C_0 V_0^2$$

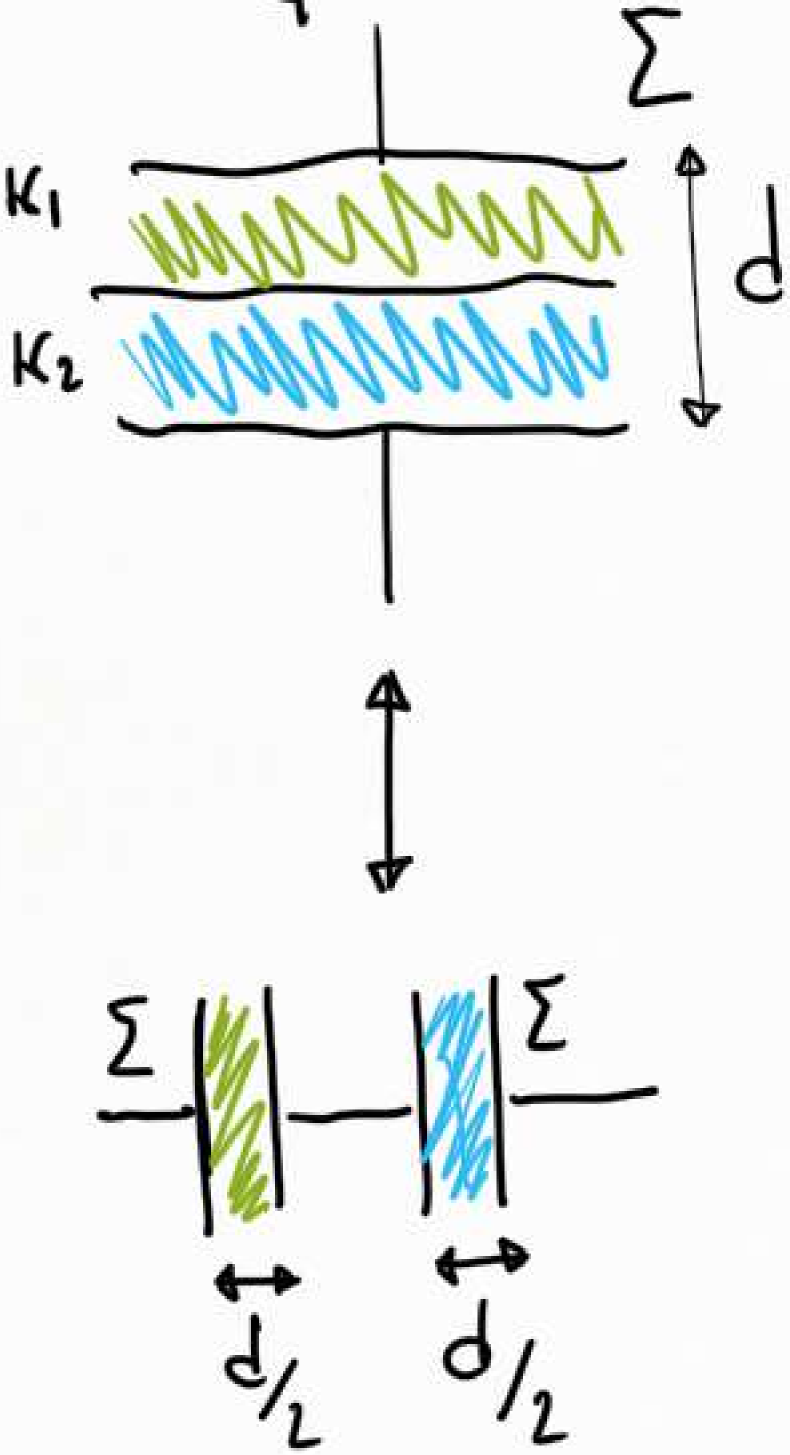
$$U_e = \frac{1}{2} C \Delta V^2$$

$$C_0 = \frac{\varepsilon_0 \Sigma}{d} = \frac{\varepsilon_0 \pi R^2}{d}$$

2) $E = \frac{V_0}{d}$, $q = C V_0$

3) $P = \varepsilon_0 (K-1) E$, $\vec{P} = \varepsilon_0 (K-1) \vec{E}$

4.36 MNV



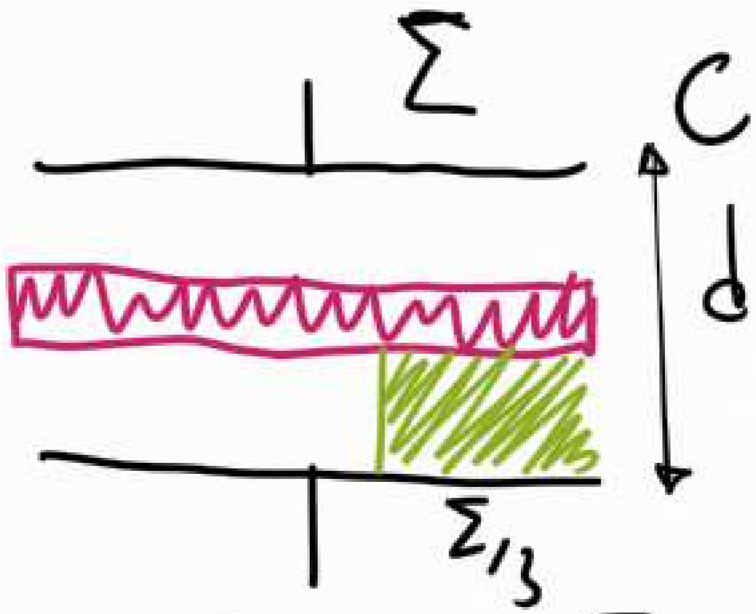
1) $C = ?$ 2) dato ΔV, $q = ?$, $U_e = ?$

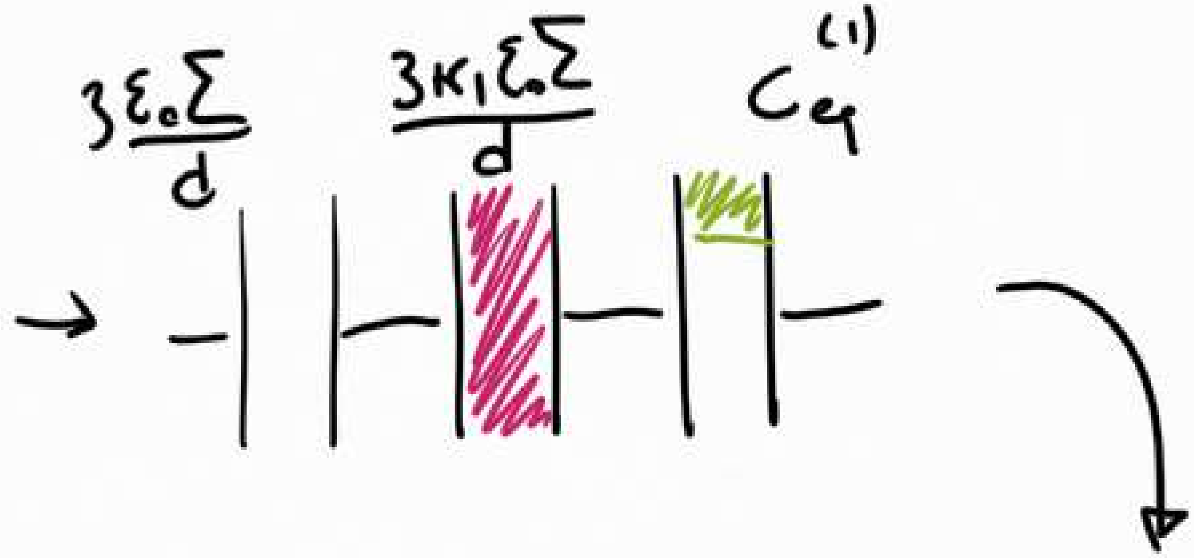
$$\Delta V = \Delta V_1 + \Delta V_2 = E_1 \frac{d}{2} + E_2 \frac{d}{2} =$$

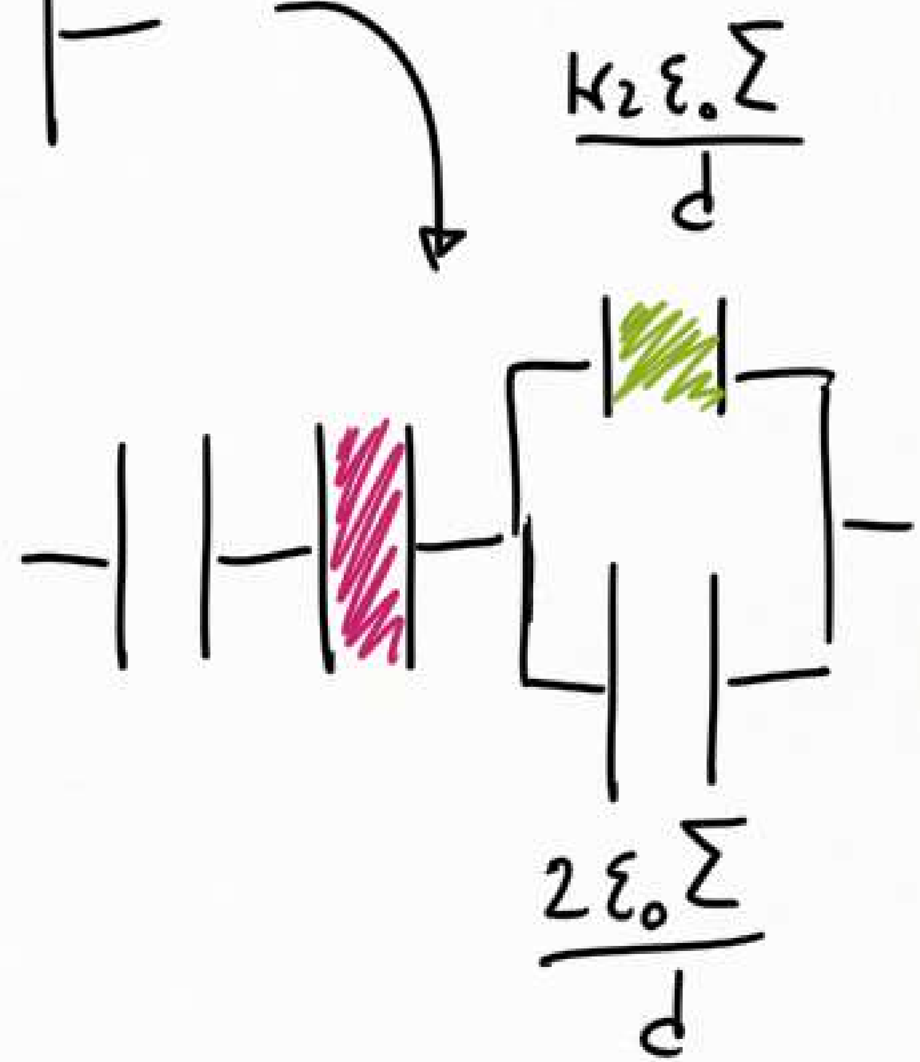
$$= \frac{E_0}{\kappa_1}\frac{d}{2} + \frac{E_0}{\kappa_2}\frac{d}{2} = \frac{q}{\Sigma \varepsilon_0}\frac{d}{2}\left(\frac{1}{\kappa_1} + \frac{1}{\kappa_2}\right) \equiv$$

$$= \frac{q}{C} \Rightarrow \frac{1}{C} = \frac{d}{2}\frac{1}{\kappa_1 \Sigma \varepsilon_0} + \frac{d}{2}\frac{1}{\kappa_2 \Sigma \varepsilon_0} =$$

$$= \frac{1}{C_1} + \frac{1}{C_2}$$







$$C_{eq}^{(1)} = \frac{\kappa_2\varepsilon_0\Sigma}{d} + \frac{2\varepsilon_0\Sigma}{d}.$$

$$\frac{1}{C} = \frac{d}{3\varepsilon_0\Sigma} + \frac{d}{3\kappa_1\varepsilon_0\Sigma} + \frac{1}{C_{eq}^{(1)}}$$