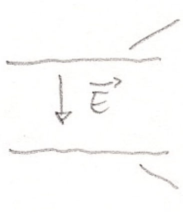
G1

$$\boxed{C = \underbrace{\varepsilon_0}_{8{,}85\ 10^{-12}} \frac{\overset{2}{S}}{\underset{5\ 10^{-3}}{d}} = 3{,}54\ 10^{-9}\ \mathrm{F}}$$

$$\boxed{q = \underbrace{C}_{3{,}54\ 10^{-9}}\ \underbrace{V_{ab}}_{10^4} = 3{,}54\ 10^{-5}\ \mathrm{C}}$$



$V = 10^4$ Volt

$V = 0$

$\boxed{E\ ?}$

2 OPTIONS
POSSIBLES

$$E = -\frac{\partial V}{\partial x}$$

$$E = \frac{\overset{10^4}{V_{ab}}}{\underset{5\ 10^{-3}}{d}}$$

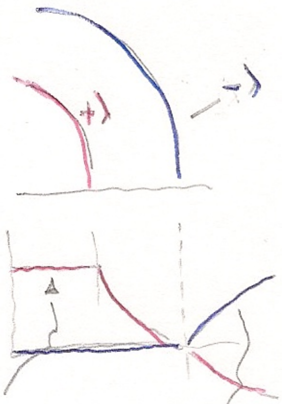
$$= 2 \cdot 10^6\ \underbrace{\mathrm{V/m}}_{\mathrm{N/C}}\ \text{:-)}$$

$$E = \frac{\overset{= q/S}{\sigma}}{2\varepsilon_0} - \left(\frac{-\sigma}{2\varepsilon_0}\right)$$

$$= \frac{\overset{3{,}54\ 10^{-5}}{q}}{\underset{2}{S}\ \underset{8{,}85\ 10^{-12}}{\varepsilon_0}} = 2\ 10^6\ \mathrm{N/C}$$

$$\boxed{E = 2\ 10^6\ \mathrm{N/C}}$$

G2



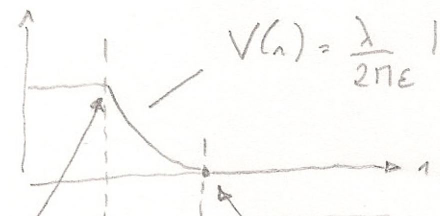
C'EST
EXACTEMENT
LA SITUATION
DE L'EXERCICE S7 :-)

SO EASY
THE RETURN

$$V = \frac{\lambda}{2\pi\varepsilon} \ln\left(\frac{b}{a}\right)$$

$$V(r) = \frac{1}{2\pi\varepsilon_0} \ln\left(\frac{b}{r}\right)$$

$$V(r) = \frac{-\lambda}{2\pi\varepsilon} \ln\left(\frac{b}{r}\right)$$



$$V(r) = \frac{\lambda}{2\pi\varepsilon} \ln\left(\frac{b}{r}\right)$$

$\boxed{V = 0}$

$$\boxed{V_{ab} = \frac{\lambda}{2\pi\varepsilon_0} \ln\left(\frac{b}{a}\right)}$$

$$\boxed{C = \frac{\overbrace{\lambda L}^{q}}{\lambda / 2\pi\varepsilon_0 \ln(b/a)}}$$

$$\boxed{C = \frac{2\pi\varepsilon_0 L}{\ln(b/a)}}$$

$$\boxed{E(r) = \frac{\lambda}{2\pi\varepsilon} \frac{1}{r} = \frac{V_{ab}}{\ln(b/a)} \frac{1}{r}}$$

2 OPTIONS POUR CALCULER U_c !

$$u(r) = \frac{1}{2}\varepsilon_0 \underbrace{E^2(r)}_{\frac{\lambda^2}{4\Pi^2\varepsilon_0^2}\frac{1}{r^2}}$$

$$\boxed{u(r) = \frac{\lambda^2}{8\Pi^2\varepsilon_0}\frac{1}{r^2}}$$

$$U = \int_0^L\int_0^{2\Pi}\int_a^b u(r)\, r\, d\theta\, dr\, dz$$

$$= 2\Pi L \frac{\lambda^2}{8\Pi^2\varepsilon_0}\left[\ln(r)\right]_a^b$$

$$\boxed{U = \frac{L\lambda^2}{4\Pi\varepsilon_0}\ln(b/a)}$$

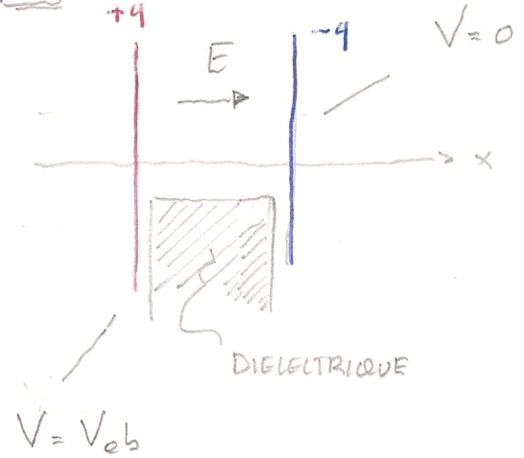
EN INTEGRANT LA DENSITE D'ENERGIE ELECTRIQUE...

$$U = \frac{q^2}{2C} = \frac{\lambda^2 L^2}{2}\frac{\ln(b/a)}{2\Pi\varepsilon_0 L}$$

$$= \frac{L\lambda^2}{4\Pi\varepsilon_0}\ln(b/a)$$

BIEN PLUS SIMPLE NON ?

$\boxed{63}$



CAS 1

$\boxed{V_{ab} \text{ MAINTENU CONSTANT} \rightsquigarrow \text{LES CHARGES VONT CHANGER !}}$ → $\boxed{E = E_0}$

VIDE $C_0 = \varepsilon_0 \dfrac{S}{d}$

DIELECTRIQUE $C = K \underbrace{\varepsilon_0 \dfrac{S}{d}}_{C_0}$ → $\boxed{C = K q_0}$

$V = \dfrac{q_0}{C_0} = \dfrac{q}{K C_0}$ → $\boxed{q = K q_0}$

$U = \dfrac{1}{2} C V^2 = K \underbrace{\dfrac{1}{2} C_0 V^2}_{U_0}$ → $\boxed{U = K U_0}$

CAS 2

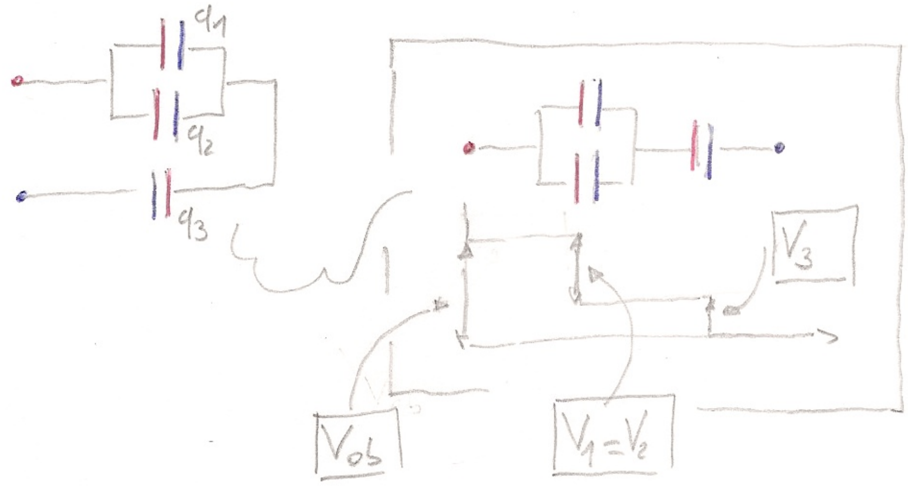
$\boxed{q \text{ MAINTENU CONSTANT} \rightsquigarrow V \text{ VA CHANGER}}$

$V_0 = \dfrac{q}{C_0}$

$V = \dfrac{q}{K C_0}$ → $\boxed{V = \dfrac{V_0}{K} \quad E = \dfrac{E_0}{K}}$

$U = \dfrac{1}{2} q V = \underbrace{\dfrac{1}{2} q V_0}_{U_0} \dfrac{1}{K}$ → $\boxed{U = \dfrac{U_0}{K}}$

G4



$$V_2 = \frac{q_2}{C_2} = \frac{30\ 10^{-6}}{3\ 10^{-6}} \qquad \boxed{V_2 = V_1 = 10 \text{ Volt}}$$

$$V_1 = \frac{q_1}{C_1} \longrightarrow \boxed{q_1 = 60\ \mu C}$$

$$q_3 = q_1 + q_2 \longrightarrow \boxed{q_3 = 90\ \mu C} \qquad \boxed{V_3 = \frac{q_3}{C_3} = 18 \text{ Volt}}$$

$$\boxed{V_{ab} = V_1 + V_3 = 28 \text{ Volt}}$$

AUTRE OPTION

$$\frac{1}{C_{123}} = \frac{1}{C_{12}} + \frac{1}{C_3} = \underbrace{\frac{1}{9} + \frac{1}{5}}_{\frac{14}{45}}$$

$$C_{12} = C_1 + C_2$$

$$\boxed{C_{123} = \frac{45}{14}\ 10^{-6}\ F}$$

$$\boxed{V_{ab} = \frac{\overset{90\ 10^{-6}}{q}}{\underset{\frac{45}{14}10^{-6}}{C_{123}}} = \frac{90 \times 14}{45} = 28 \text{ Volt}}$$

G5

$$\boxed{C = K \varepsilon_0 \frac{S}{d}} \qquad C = 1.45\ 10^{-9},\quad K = 3.2,\quad \varepsilon_0 = 8.85\ 10^{-12}$$

$$\longrightarrow \frac{1}{d} = \frac{C}{K \varepsilon_0 S}$$

$$\boxed{\frac{\overset{5200 \text{ Volt}}{V}}{d} < \underbrace{E_m}_{1.5\ 10^7}}$$

$$\frac{CV}{K \varepsilon_0 S} < E_m$$

LA CONDITION A SATISFAIRE :-) $\boxed{\frac{CV}{K \varepsilon_0 E_m} < S}$

$$\boxed{177\ 10^{-4}\ m^2 < S}$$