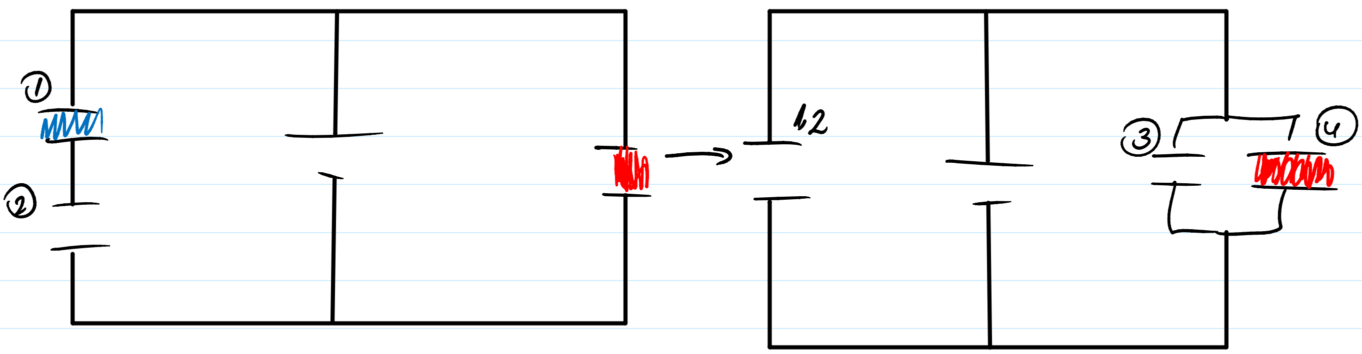
Nombre: Felipe Ferrada Morales   Rol: 201973606-K

P_1

a)

C_1 en serie con C_2

sin dielectrico $C = C_0$



$C_1 = k_1 C_0$
$= 2C_0$

entonces $C_{1,2} =$

$$\frac{1}{C_{1,2}} = \frac{1}{C_1} + \frac{1}{C_2} = \frac{1}{2C_0} + \frac{1}{C_0}$$

$$\frac{1}{C_{1,2}} = \frac{3}{2C_0}$$

$$C_{1,2} = \frac{2}{3} C_0$$

C_3 y C_4 están en paralelo

$C_3 =$ $C_0 = \frac{\varepsilon_0 A}{d}$ $C_3 = \frac{\varepsilon_0}{d}\frac{A}{3} = \frac{\varepsilon_0 A}{d} \cdot \frac{1}{3}$

$C_3 = \frac{1}{3} C_0$ y $C_4 = \frac{2}{3} k_3 C_0$

$C_3 = \frac{1}{3} C_0$ y $C_4 = \frac{2}{3} k_3 C_0$

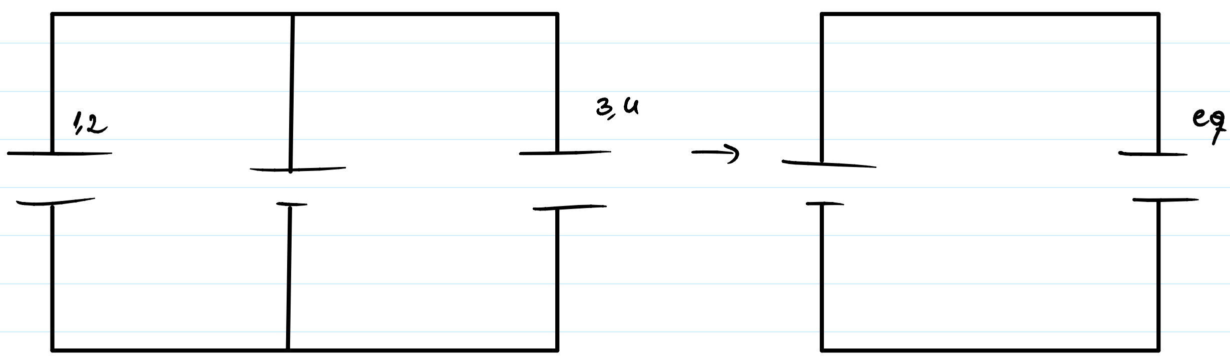
$C_4 = \frac{6}{3} C_0$

$C_4 = 2C_0$

entonces $C_{3,4} = \frac{1}{3} C_0 + 2C_0 \frac{3}{3}$

$= \frac{7\,C_0}{3}$

$\Rightarrow$



$C_{1,2}$ en paralelo con $C_{3,4}$

$C_{eq} = \frac{2}{3} C_0 + \frac{7}{3} C_0$

$C_{eq} = \frac{9}{3} C_0 = 3C_0$ //

para la carga en cada capacitor

$Q = C \Delta V$

entonces $Q_{eq} = C_{eq} \Delta V$

$Q_{eq} = 3C_0 V_0$ //

$$Q_{1,2} = C_{1,2} \cdot \Delta V \qquad\qquad Q_{3,4} = C_{3,4} \cdot \Delta V$$

$$= \frac{2}{3} C_0 V_0 \qquad\qquad = \frac{7}{3} C_0 V_0$$

$$Q_1 = Q_2 = Q_{1,2} = \frac{2}{3} C_0 V_0$$

$$Q_3 = Q_{3,4} = C_{3,4} V_0$$

$$= \frac{7}{3} C_0 V_0$$

b)

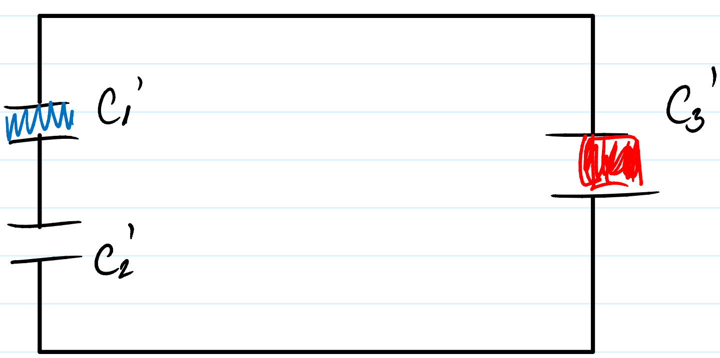
$$Q_1 = \frac{2}{3} C_0 V_0$$

$$Q_2 = \frac{2}{3} C_0 V_0$$

$$Q_3 = \frac{7}{3} C_0 V_0 \qquad //$$

c)

Al desconectar la batería:



$$\Delta V_1 = \frac{Q_1}{C_1} = \frac{\frac{\cancel{2}}{3} C_0 V_0}{\cancel{2} C_0} = \frac{V_0}{3}$$

$$\Delta V_2 = V_0 - \frac{V_0}{3} = \frac{2}{3} V_0$$

$$\Delta V_3 = V_0$$

Ahora : $\Delta V_1' = K_1 \Delta V_1 = K_1 \frac{V_0}{3} = \frac{2}{3} V_0$

$$\Delta V_2' = \Delta V_2 = \frac{2V_0}{3}$$

$$\Delta V_3' = K_3 \Delta V_3 = 3V_0$$

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P_2

a)

Sabemos que $\Delta U = \underbrace{\frac{\rho l}{A}}_{R} \cdot I$

$\therefore \; R = \frac{\rho l}{A} \Rightarrow \rho = \frac{RA}{l}$

para la resistencia del material azul:

$$R_{azul} = \frac{\rho_{azul} \, l_{azul}}{A_{azul}} = \frac{\rho_0 \cdot L}{\text{Area superficial}}$$

$$\text{Area superficial} = \frac{\text{Area hexagono}}{2}$$

$$A \text{ hexagono} = \frac{3\sqrt{3}\, b^2}{2}$$

$$A. \text{ superficial} = \frac{3\sqrt{3}\, b^2}{4}$$

$$R_{azul} = \frac{\rho_0 \cdot L}{\frac{3\sqrt{3}\, b^2}{4}} = \frac{4 \rho_0 \cdot L}{3\sqrt{3}\, b^2}$$

$$R_{amarillo} = \frac{2\rho_0 \cdot L}{\frac{3\sqrt{3}\, b^2}{4}} = \frac{8\rho_0 \cdot L}{3\sqrt{3}\, b^2}$$

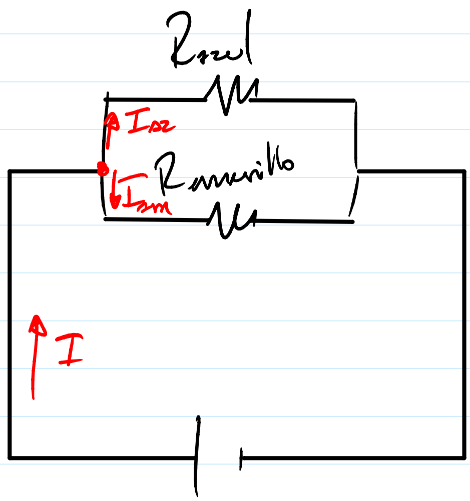
Luego habría que sacar R_{eq} en paralelo entre azul y amarillo

$$\frac{1}{R_{eq}} = \frac{1}{\frac{4\rho_0 \cdot L}{3\sqrt{3}\,b^2}} + \frac{1}{\frac{8\rho_0 \cdot L}{3\sqrt{3}\,b^2}}$$

$$\frac{1}{R_{eq}} = \frac{3\sqrt{3}\,b^2}{4\rho_0 \cdot L} + \frac{3\sqrt{3}\,b^2}{8\rho_0 \cdot L}$$

$$\frac{1}{R_{eq}} = \frac{9\sqrt{3}\,b^2}{8\rho_0 \cdot L} \Rightarrow R_{eq} = \frac{8\rho_0 \cdot L}{9\sqrt{3}\,b^2} \quad //$$

b)



$$V = IR$$

$$I = \frac{V}{R}$$

$$I = \frac{V_0}{R_{eq}}$$

$$I_{az} = \frac{V_0}{\frac{4\rho_0 \cdot L}{3\sqrt{3}\,b^2}} = \frac{V_0\, 3\sqrt{3}\,b^2}{4\rho_0 \cdot L}$$

$$I_{am} = \frac{V_0}{\frac{8\rho_0 \cdot L}{3\sqrt{3}\,b^2}} = \frac{V_0\, 3\sqrt{3}\,b^2}{8\rho_0 \cdot L}$$

Resistividad promedio $= \frac{2\rho_0 + \rho_0}{2} = \frac{3\rho_0}{2}$

Resistencia total $= \frac{\rho \cdot l}{\;}$

$$\text{Resistencia total} = \frac{\rho \cdot l}{\text{Area total}}$$

$$= \frac{\frac{\cancel{3}\rho_0}{\cancel{2}} \cdot L}{\frac{\cancel{3}\sqrt{3}\, b^2}{\cancel{2}}} = \frac{\rho_0 \cdot L}{\sqrt{3}\, b^2}$$

$$I_{total} = \frac{V_0 \sqrt{3}\, b^2}{\rho_0 \cdot L}$$

No concuerdan, ya que la R_{eq} en paralelo no es lo mismo que el promedio de estas R.

c)

Si $\rho_{azul} \gg \rho_{amarillo}$

$$R_{eq} \Rightarrow \left(\frac{3\sqrt{3}\, b^2}{4 \rho_{azul} \cdot L} + \frac{3\sqrt{3}\, b^2}{4 \rho_{amarillo} \cdot L} \right)^{-1} = \left(\frac{3\sqrt{3}\, b^2 \left(\cancel{\rho_{azul} + \rho_{amarillo}} \xrightarrow{} \rho_{azul} \right)}{4 \cdot L \cdot \rho_{azul} \cdot \rho_{amarillo}} \right)^{-1}$$

$$= \left(\frac{3\sqrt{3}\, b^2 \cancel{\rho_{azul}}}{4 \cdot L\, \cancel{\rho_{azul}} \cdot \rho_{amarillo}} \right)^{-1} = \left(\frac{3\sqrt{3}\, b^2}{4 \cdot L \cdot \rho_{amarillo}} \right)^{-1}$$

$\therefore$ solo depende de la resistividad menor.

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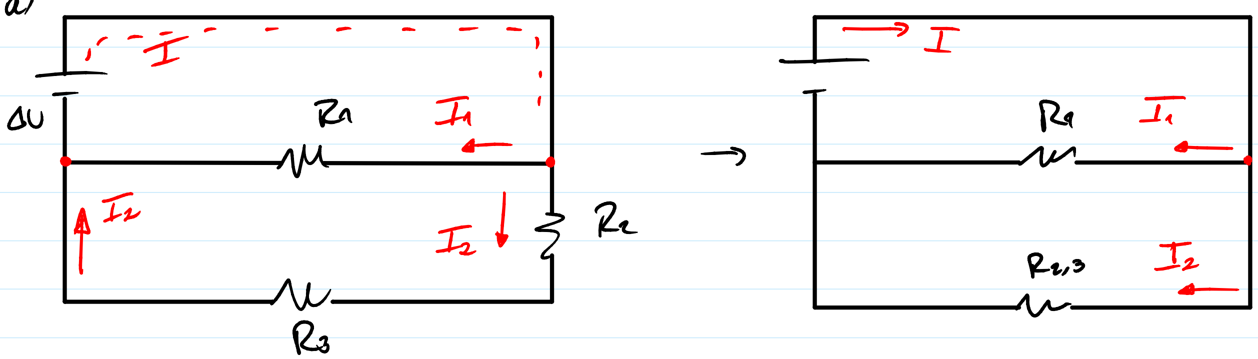
P_3

a)



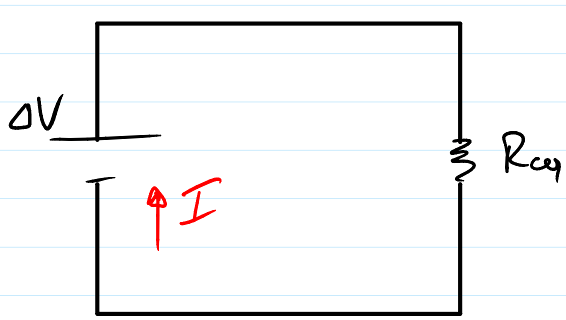
R_2 y R_3 en serie

$$R_{2,3} = R_2 + R_3 = 2R + 3R = 5R$$

R_1 y $R_{2,3}$ en paralelo

$$\therefore R_{eq} \Rightarrow \frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_{2,3}} = \frac{1}{R} + \frac{1}{5R}$$

$$\frac{1}{R_{eq}} = \frac{6}{5R} \Rightarrow R_{eq} = \frac{5}{6}R$$



$I = I_1 + I_2$

$$\Delta V = I \cdot R_{eq} = I \cdot \frac{5}{6} R$$

$$I = \frac{6}{5R} \cdot \Delta V$$

$$I_1 = \frac{V_1}{R_1} = \frac{\Delta V}{R} \quad //$$

$$I_2 = \frac{V_2}{R_{2,3}} = \frac{\Delta V}{5R} \quad //$$

b) Para las potencias $P_R = I^2 R$

para R_1, $P_{R_1} = (I_1)^2 \cdot R_1$

$$= \left(\frac{\Delta V}{R}\right)^2 \cdot \cancel{R}$$

$$P_{R_1} = \frac{\Delta V^2}{R} \quad //$$

para R_2 $P_{R_2} = (I_2)^2 \cdot R_2$

$$= \left(\frac{\Delta V}{5R}\right)^2 \cdot 2\cancel{R}$$

$$= \frac{2 \Delta V^2}{25 R} \quad //$$

para R_3 $P_{R_3} = (I_{R_3})^2 \cdot R_3$

$$= \left(\frac{\Delta V}{5R}\right)^2 \cdot 3\cancel{R}$$

$$= \frac{3 \Delta V^2}{25 R} \quad //$$

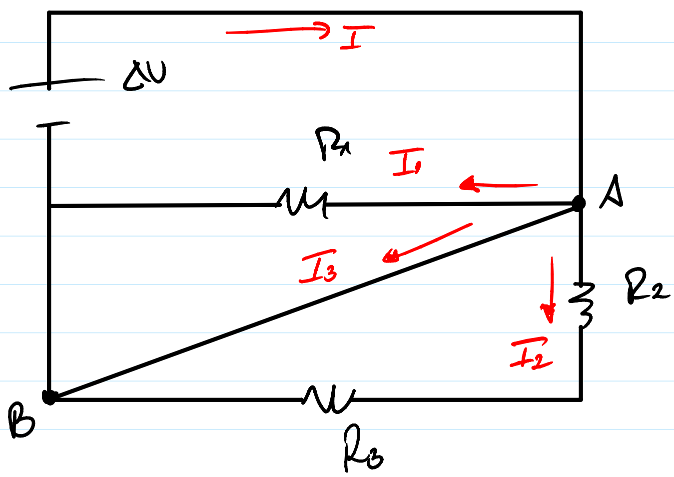
c)

$P_1 \quad \frac{\Delta V^2}{R} \qquad P_2 \quad \frac{2\Delta V^2}{25R} \qquad P_3 \quad \frac{3\Delta U^2}{25R}$

$P_1 > P_3 > P_2$

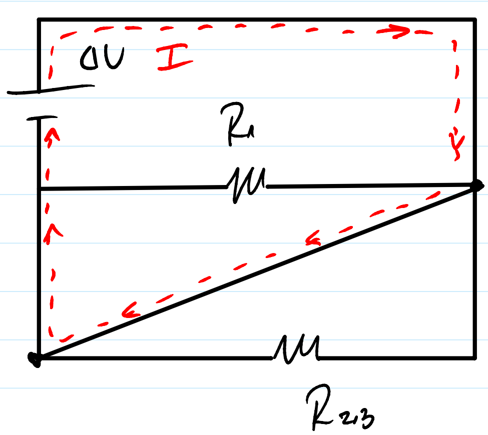
Se evapora primero el fluido de R_1 ya que es la que libera más energía

d)



R_2 y R_3 en serie

$R_{2,3} = R_2 + R_3 = 2R + 3R = 5R$



Por el hecho de ser un cable ideal, la corriente va a pasar por este cable, en vez de el que tiene a $R_{2,3}$

$\therefore$ No existe una Resistencia equivalente.