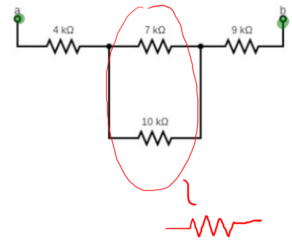
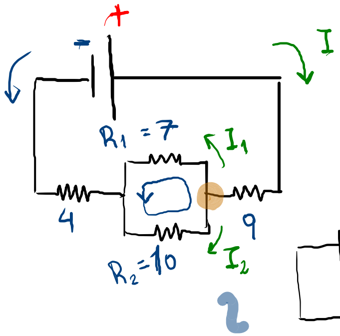
2.1.6- a) Determinar la resistencia equivalente entre *a* y *b* para el circuito de la figura.
b) Determinar la corriente en cada resistencia si los puntos se conectan a una batería de 34 V.
c) Para el caso anterior, calcular la potencia disipada por cada resistencia y la potencia entregada por la batería al circuito.

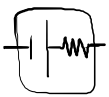


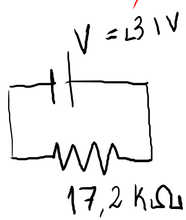
a) $R_{eq_{total}} = 17{,}2\ k\Omega$

$$R_{eq} = 4.2\ k\Omega = \frac{1}{\frac{1}{10\ k\Omega} + \frac{1}{7\ k\Omega}}$$

b)







$(RI - V = 0$: mallas$)$

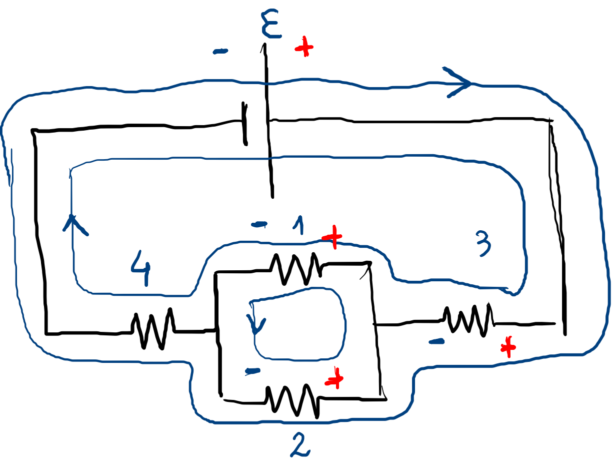
$V = RI$

$I = \frac{V}{R} = 1.98\ mA$

$$\begin{cases} I_1 R_1 - I_2 R_2 = 0 & \text{(mallas)} \\ I_1 + I_2 = I & \text{(nodos)} \end{cases} \rightarrow \begin{cases} I_1 = \frac{R_2}{R_1} I_2 \\ \frac{R_2}{R_1} I_2 + I_2 = I = \left(\frac{R_2}{R_1} + 1\right) I_2 \end{cases}$$

$\frac{10}{7} + 1 = \frac{17}{7} \approx 2.43$

$$\rightarrow \boxed{\begin{aligned} I_1 &= 1.16\ mA \\ I_2 &= 8.15 \times 10^{-4}\ A \end{aligned}}$$



Mallas:

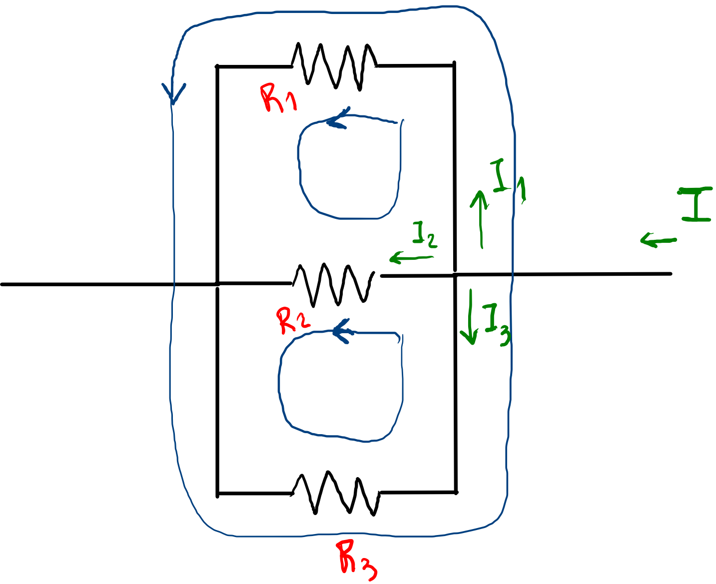
$$\begin{cases} V_1 - V_2 = 0 \\ V_3 + V_1 + V_4 - \varepsilon = 0 \\ V_3 + V_2 + V_4 - \varepsilon = 0 \end{cases}$$

$$\rightarrow I = I_1 + I_2 \rightarrow \frac{\varepsilon}{R_{eq}} = \frac{V_1}{R_1} + \frac{V_2}{R_2}$$

$R_1 I_1 = V_1$

$R_2 I_2 = V_2$

$R_{eq} I = \varepsilon$



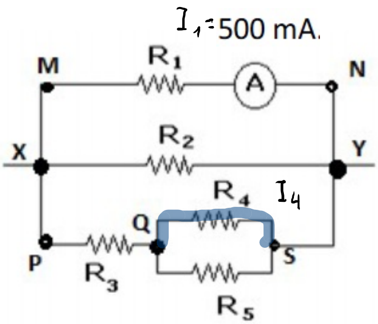
$$\begin{cases} I_1 R_1 - I_2 R_2 = 0 \\ I_2 R_2 - I_3 R_3 = 0 \\ I_1 R_1 - I_3 R_3 = 0 \end{cases}$$

$$I_2 = \frac{R_1}{R_2} I_1$$

$$I_3 = \frac{R_1}{R_3} I_1$$

- $I = I_1 + I_2 + I_3$

(12)



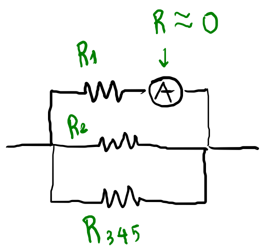
$$R_{eq} = \frac{R_A R_B}{R_A + R_B}$$

R_1 = 2,00 Ω, R_2 = 4,00 Ω, R_3 = 1,00 Ω, R_4 = 2,00 Ω, R_5 = 1,00 Ω.

a Hallar Req total

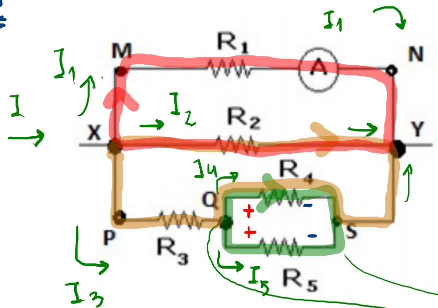
1) $$R_{45} = \frac{R_4 R_5}{R_4 + R_5} = 0.667\,\Omega$$

$$R_{345} = R_3 + R_{45} = 1.67\,\Omega$$



$$R_{12345} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_{345}}} = 0.74\,\Omega$$

b



$I_1 = 500\,mA$

¿I_4?

$V_{XY} = R_1 I_1$

$$R_1 I_1 - R_2 I_2 = 0$$
$$\frac{R_1 I_1}{R_2} = I_2 = 250\,mA$$

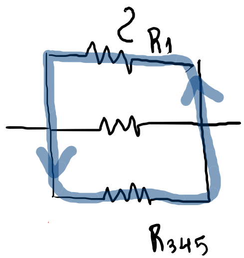
$R_{45} = 0.667\,\Omega$

$R_{345} = 1.67\,\Omega$

$R_{12345} = 0.74\,\Omega$

$R_1 = 2{,}00\ \Omega$, $R_2 = 4{,}00\ \Omega$, $R_3 = 1{,}00\ \Omega$, $R_4 = 2{,}00\ \Omega$, $R_5 = 1{,}00\ \Omega$.

$$\begin{cases} I_4 R_4 - I_5 R_5 = 0 \\ I_3 = I_4 + I_5 \end{cases}$$



$I_3 R_{345} = I_1 R_1$

$I_3 = 600\,mA$

$I_1 = 500\,mA$

$$I_5 = \frac{R_4}{R_5} I_4 = \frac{2{,}00}{1{,}00} I_4 = 2 I_4$$

$$\Rightarrow (1 + 2) I_4 = I_3$$

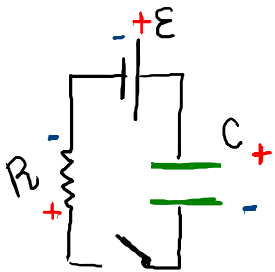
$$I_4 = \frac{I_3}{3} = 200\,mA$$

c $V_{R_3} = 600\,mV$

d $I_{tot} = 1350\,mA$

~~1450~~

CIRCUITOS RC (en serie)



$$RI - \varepsilon + \underbrace{V_{cap}}_{=\frac{Q}{C}} = 0 \leftrightarrow \frac{Q}{C} + RI = \varepsilon$$

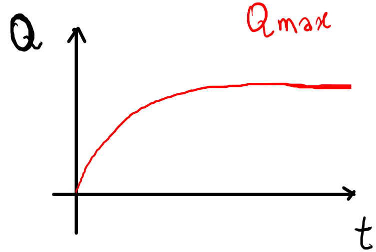
$$\boxed{\frac{Q(t)}{C} + R\frac{dQ(t)}{dt} = \varepsilon}$$ ← ec^n dif

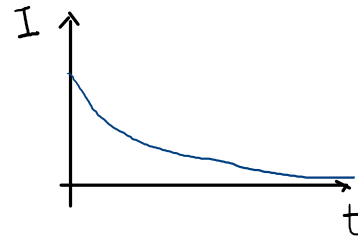
$$C = \frac{Q}{V}$$

$$\left[I = \frac{dQ}{dt} \right]$$

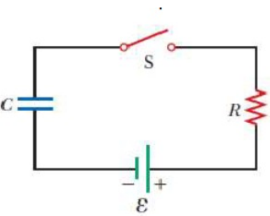
$$Q(t) = \underbrace{C\varepsilon}_{Q_{max}}\left(1 - e^{-t/RC}\right)$$

$\tau = RC$: t. característico





$$I(t) = \frac{\varepsilon}{R} e^{-t/\tau}$$



2.1.14- Considere el circuito *RC* en serie de la figura en el cual $R = 1{,}00\ \mathrm{M\Omega}$, $C = 5{,}00\ \mu\mathrm{F}$ y $\varepsilon = 30{,}0$ V. Encuentre:

a) la constante de tiempo del circuito;

b) la máxima carga en el capacitor después de que se cierra el interruptor;

c) la carga en el capacitor y la corriente que circula 10,0 s después de cerrar el interruptor,

d) el tiempo que demora en alcanzar el capacitor el 75% de la carga máxima.

a) $\tau = RC =$ $\qquad \Omega \cdot F$

$$Q(t) = C\varepsilon\left(1 - e^{-t/RC}\right)$$

b) $Q_{max} = \varepsilon C =$

$$I(t) = \frac{\varepsilon}{R} e^{-t/\tau}$$

c) $Q(t = 10{,}0s) =$

$I(t = 10{,}0s) =$

d) ¿t?

$$Q(t) = 0{,}75\cancel{Q_{max}} = \cancel{Q_{max}}\left(1 - e^{-t/\tau}\right)$$

$$0{,}75 = 1 - e^{-t/\tau}$$

$$e^{-t/\tau} = 1 - 0{,}75 = 0{,}25$$

$Q = 0{,}9\, Q_{max}$ / $2{,}3\tau$

$$e^{-t/\tau} = 0.25 \leftrightarrow -\frac{t}{\tau} = \ln(0{,}25) \leftrightarrow t = \ln(4)\,\tau = 1.39\,\tau$$

$$\left.\begin{aligned} \Omega &= \left[\frac{V}{I}\right] = \frac{J}{C}\,\frac{s}{C} \\ F &= \left[\frac{Q}{V}\right] = \frac{C}{J}\cdot C \end{aligned}\right\} \quad \frac{\cancel{C^2}}{\cancel{J}} \cdot \frac{\cancel{J}\,s}{\cancel{C^2}} = s = F\Omega$$