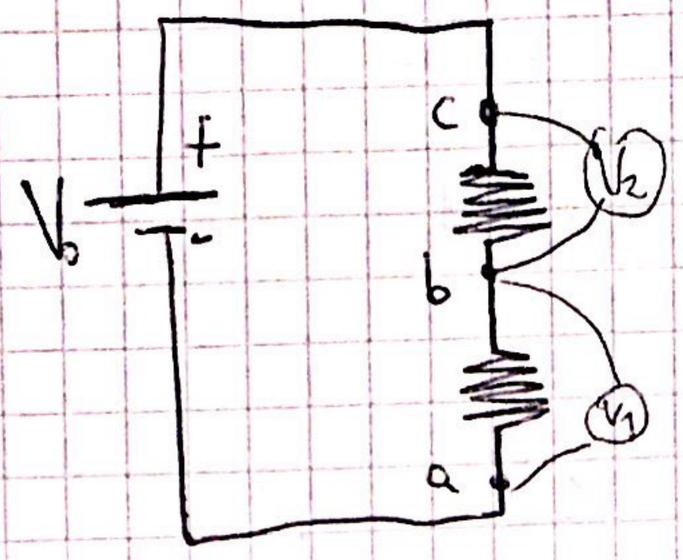
FECHA

# PRACTICO 7

## 1

a)




> Voltimetros:

$$V_0 = V_1 + V_2 = i \cdot R_1 + i \cdot R_2 \Longrightarrow i = \frac{V_0}{R_1 + R_2}$$

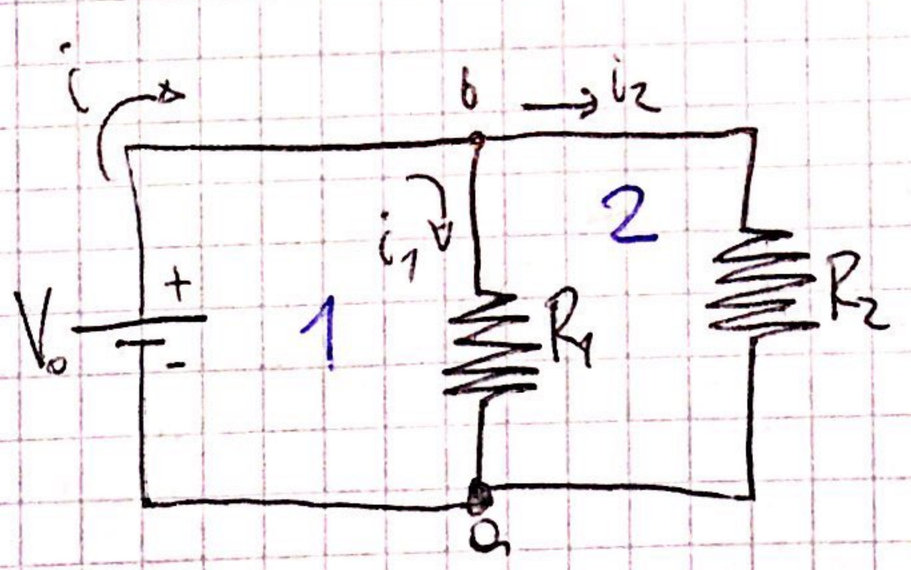
Caidas de potencial

- $V_1 = \frac{V_0 R_1}{R_1 + R_2}$
- $V_2 = \frac{V_0 R_2}{R_1 + R_2}$

b) Dado que están en serie:

$$R_{eq} = R_1 + R_2$$

## 2




a) Leyes de Kirchoff:

Por malla 1: $V_0 = V_1$

Por malla 2: $0 = V_2 - V_1 \Longrightarrow V_2 > V_1 = V_0$

NOTA

b) Por malla 1: $V_0 = i_1 \cdot R_1 \Longrightarrow \boxed{i_1 = \frac{V_0}{R_1}}$

Por malla 2: $0 = i_2 R_2 - i_1 R_1$

$= i_2 R_2 - V_0 \Longrightarrow \boxed{i_2 = \frac{V_0}{R_2}}$

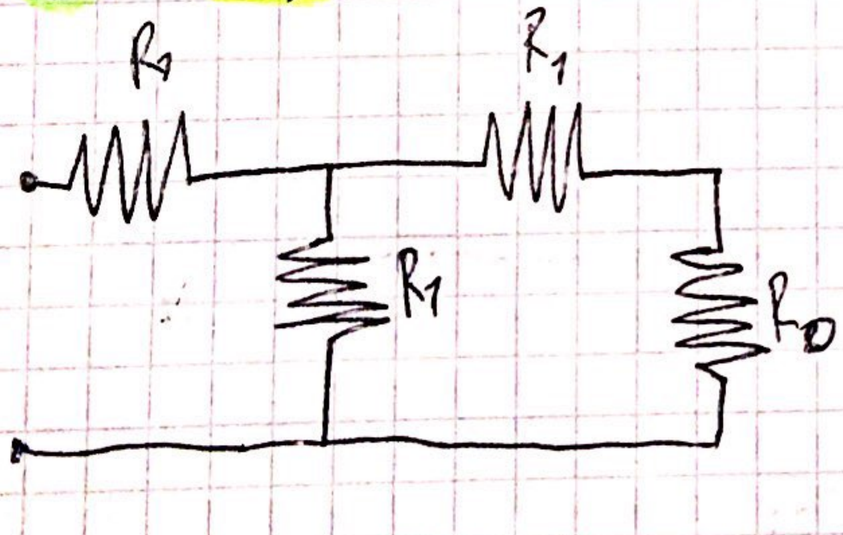
Además: $i = i_1 + i_2 = V_0 \left(\frac{1}{R_1} + \frac{1}{R_2}\right)$

c) $P_1 = i_1^2 R_1 = \left(\frac{V_0}{R_1}\right)^2 \cdot R_1 = \frac{V_0^2}{R_1}$

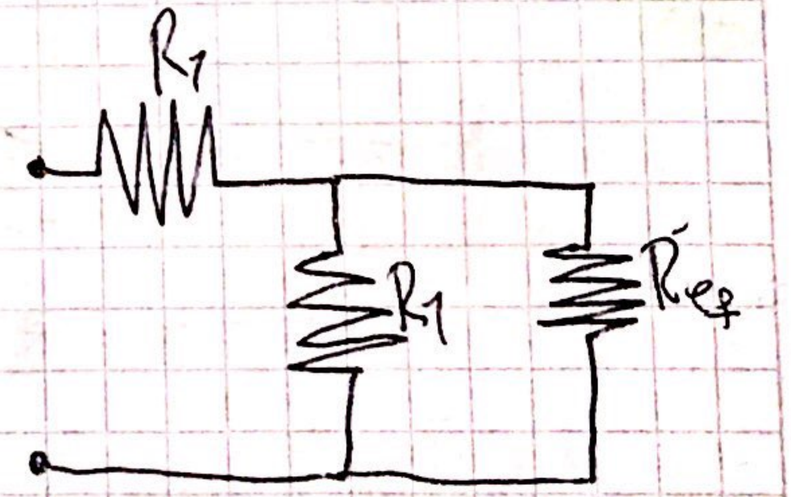
$P_2 = i_2^2 R_2 = \left(\frac{V_0}{R_2}\right)^2 \cdot R_2 = \frac{V_0^2}{R_2}$

d) $R_{eq} = \left(\frac{1}{R_1} + \frac{1}{R_2}\right)^{-1}$, pues están en paralelo

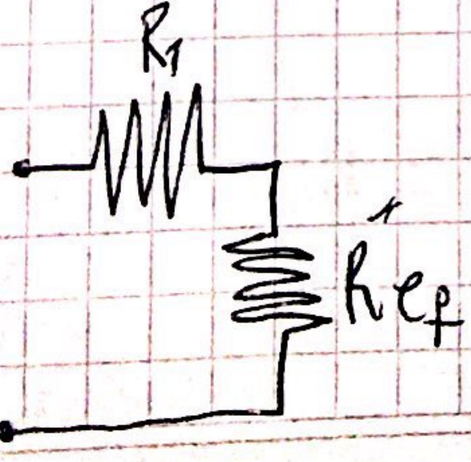
3 a)




$R'_{eq} = R_1 + R_0$




$R''_{eq} = \left(\frac{1}{R_1} + \frac{1}{R'_{eq}}\right)^{-1}$




$R'''_{eq} = R_1 + R''_{eq}$


NOTA

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$$R_{EQ} = R_1 + \left(\frac{1}{R_1} + \frac{1}{R_1+R_0}\right)^{-1}$$

b)

$$R_0 = R_1 + \left(\frac{1}{R_1} + \frac{1}{R_1+R_0}\right)^{-1}$$

$$R_0 - R_1 = \left(\frac{1}{R_1} + \frac{1}{R_1+R_0}\right)^{-1}$$

$$\frac{1}{R_0-R_1} = \frac{(R_1+R_0)+R_1}{R_1(R_1+R_0)}$$

$$\frac{R_1(R_1+R_0)}{R_0-R_1} = 2R_1+R_0$$

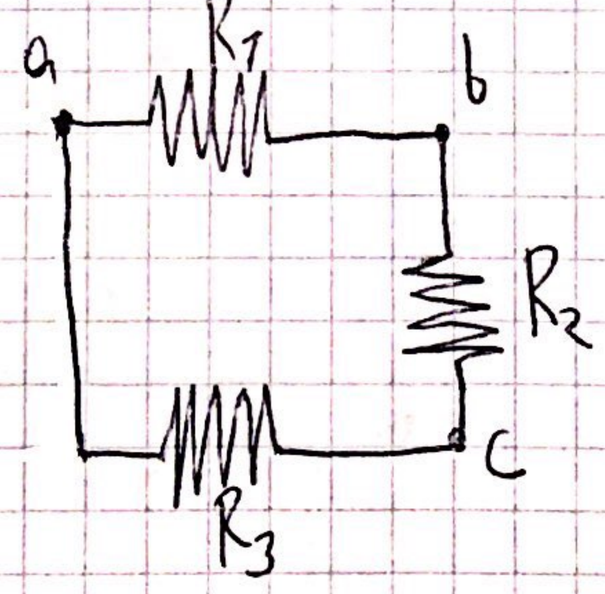
$$R_1^2 + R_1R_0 = 2R_1R_0 + R_0^2 - 2R_1^2 - R_1R_0$$

$$3R_1^2 - R_0^2 = 0$$

$$\boxed{R_1 = \frac{R_0}{\sqrt{3}}}$$

4

a)



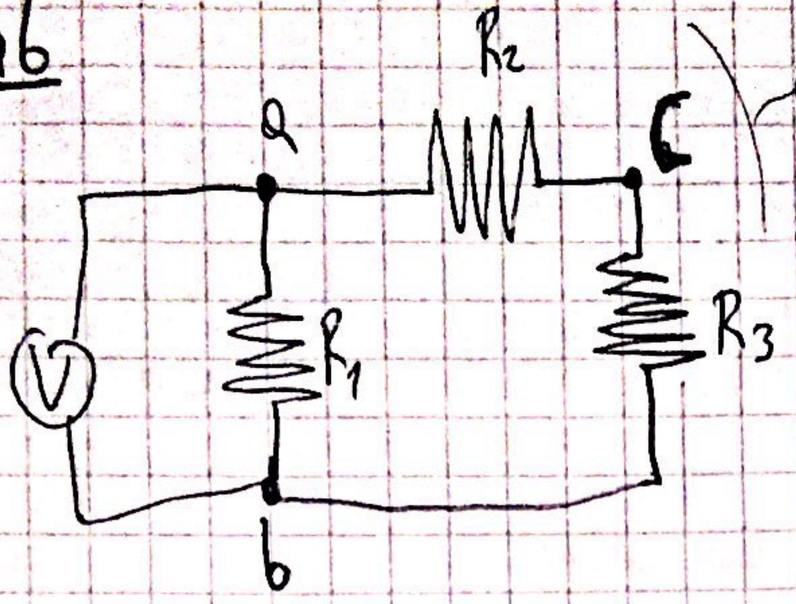

$R_2 = R_1 = 34\Omega$

$R_b = R_2 = 170\Omega$

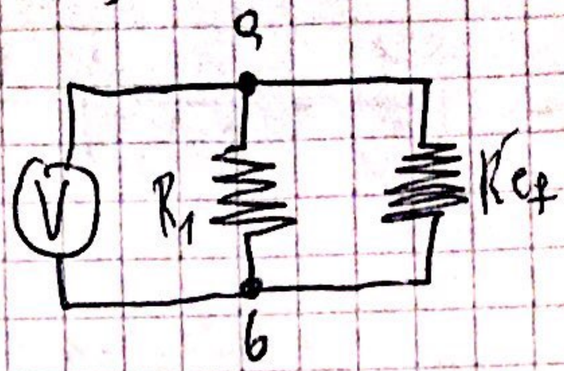
$R_c = R_3 = 85\Omega$

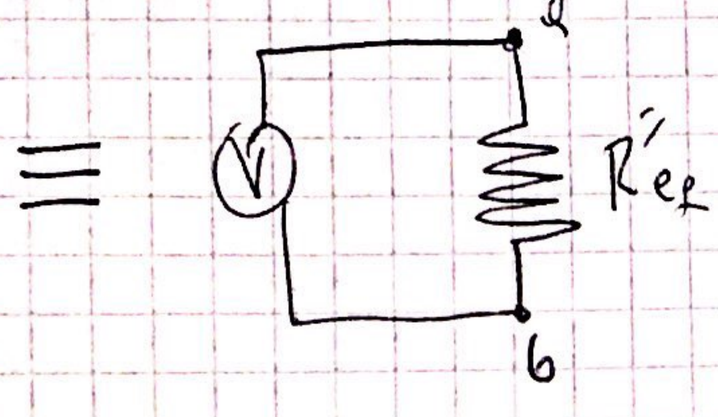
NOTA

## $R_{ab}$




$R'_{ef} = R_2 + R_3$



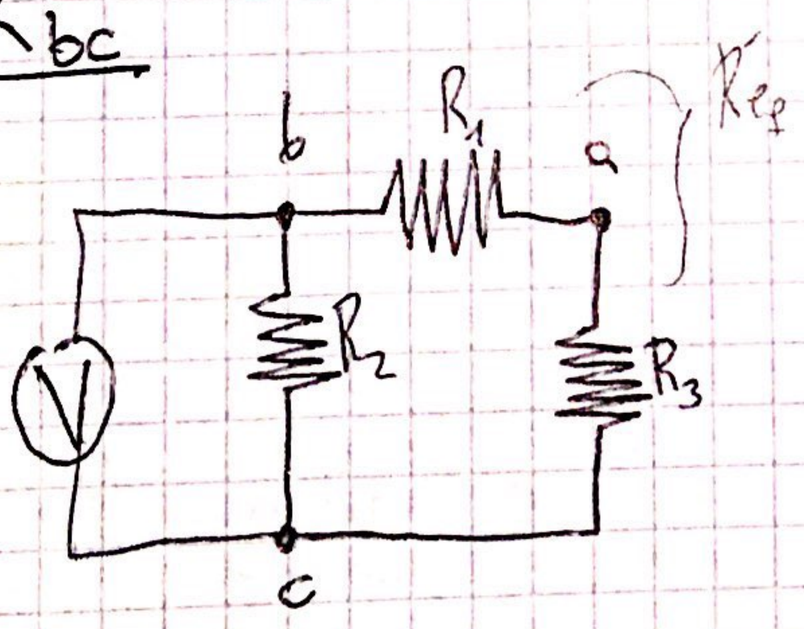




$$R''_{ef} = \left(\frac{1}{R_1} + \frac{1}{R'_{ef}}\right)^{-1}$$

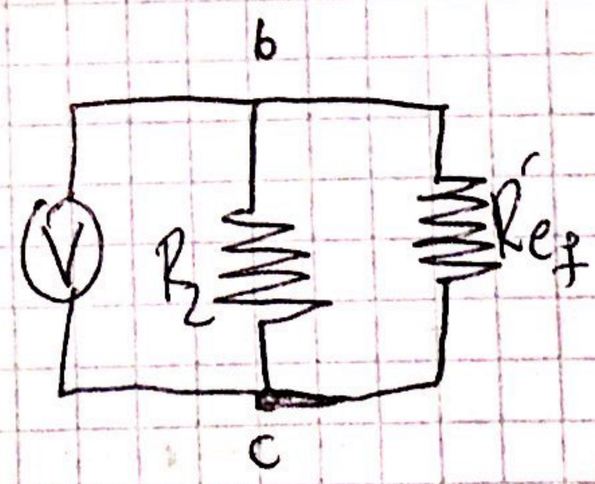
$$R_{ab} \overset{?}{=} R''_{ef} = \left(\frac{1}{R_1} + \frac{1}{R'_{ef}}\right)^{-1} = \left(\frac{1}{R_1} + \frac{1}{R_2+R_3}\right)^{-1} = \left(\frac{R_2+R_3+R_1}{R_1(R_2+R_3)}\right)^{-1}$$

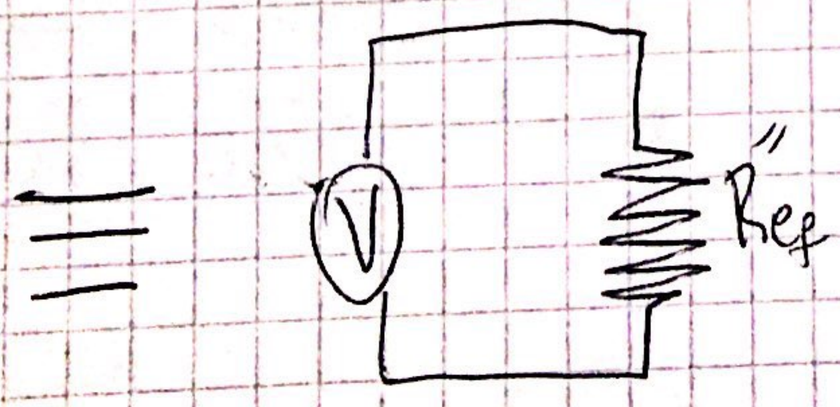
$$= \left(\frac{284\,\Omega}{(255\,\Omega)\,34\,\Omega}\right)^{-1} = 30\,\Omega$$

## $R_{bc}$




$R'_{ef} = R_1 + R_3$




$$R''_{ef} = \left(\frac{1}{R_2} + \frac{1}{R'_{ef}}\right)^{-1}$$

$$R_{bc} \overset{?}{=} R''_{ef} = \left(\frac{1}{R_2} + \frac{1}{R'_{ef}}\right)^{-1} = \left(\frac{1}{R_2} + \frac{1}{R_1+R_3}\right)^{-1} = \left(\frac{R_1+R_3+R_2}{R_2(R_1+R_3)}\right)^{-1} = \left(\frac{289\,\Omega}{110\,\Omega\,(111\,\Omega)}\right)^{-1}$$

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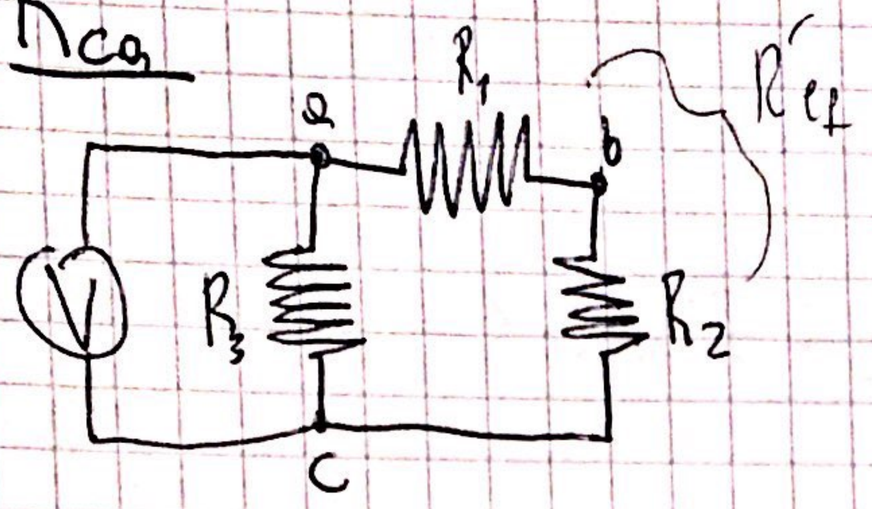
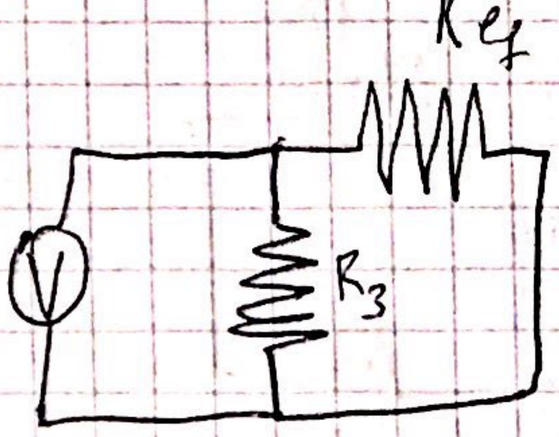
$= 70\,\Omega$ ✓

$R_{ca}$



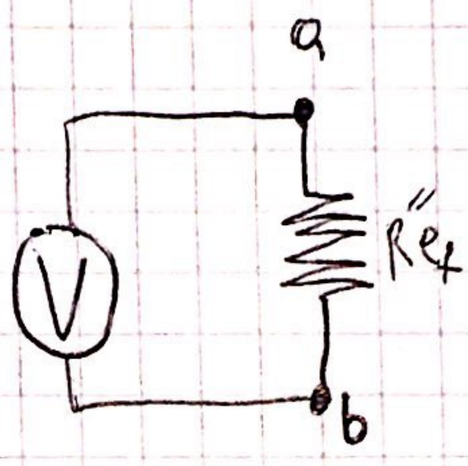

$R'_{eq} = R_1 + R_2$

$\equiv$



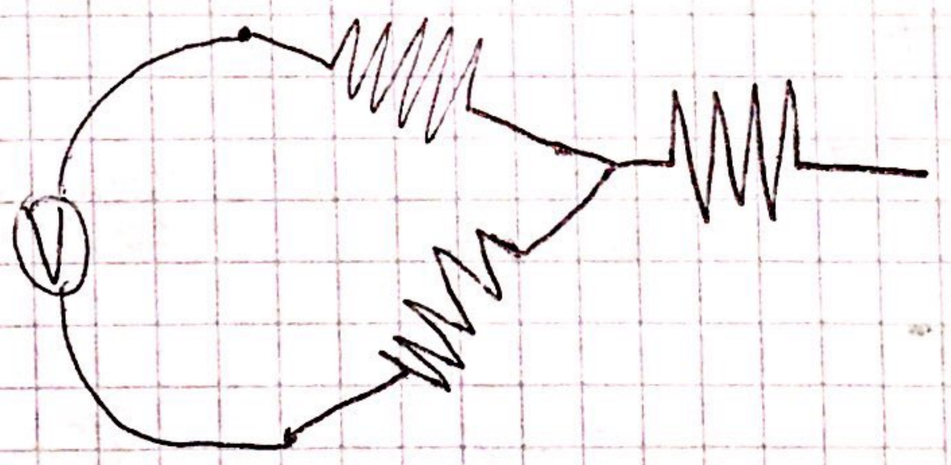

$$R''_{eq} = \left(\frac{1}{R_3} + \frac{1}{R'_{eq}}\right)^{-1}$$

$\equiv$




$$R_{ac} \overset{?}{=} R''_{eq} = \left(\frac{1}{R_3} + \frac{1}{R_1+R_2}\right) = \left(\frac{R_1+R_2+R_3}{R_3(R_1+R_2)}\right)^{-1} = \left(\frac{289\,\Omega}{85\,\Omega(204\,\Omega)}\right)^{-1} = 60\,\Omega$$ ✓

b)

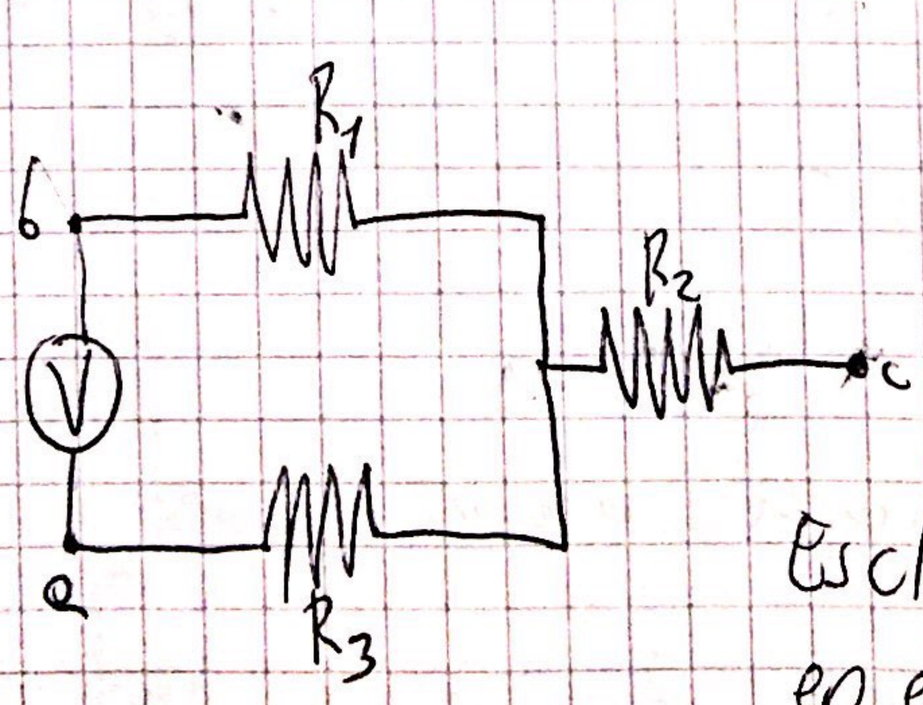



$R_1 = 20\,\Omega$

$R_2 = 50\,\Omega$

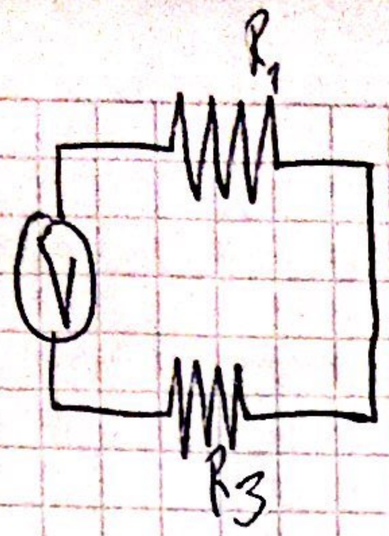
$R_3 = 10\,\Omega$

$R_{ab}$



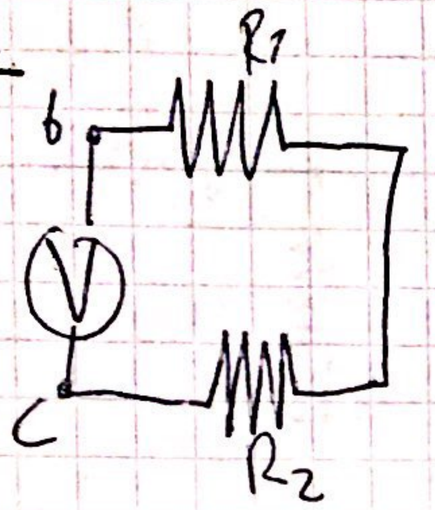

Es claro que $R_2$ no se involucra en el circuito.

NOTA



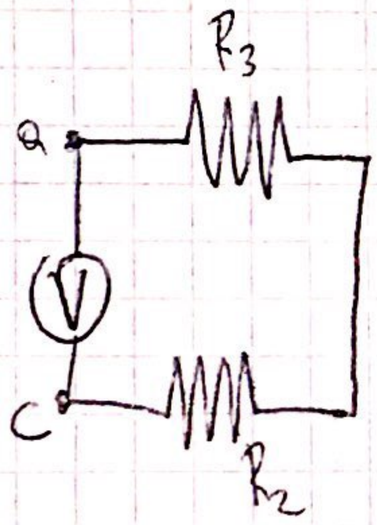

$R_{ab} \overset{?}{=} R_{ef} = R_1 + R_3 = 30\Omega$ ✓

$\underline{R_{bc}}$




$R_{bc} \overset{?}{=} R_{ef} = R_1 + R_2 = 70\Omega$ ✓

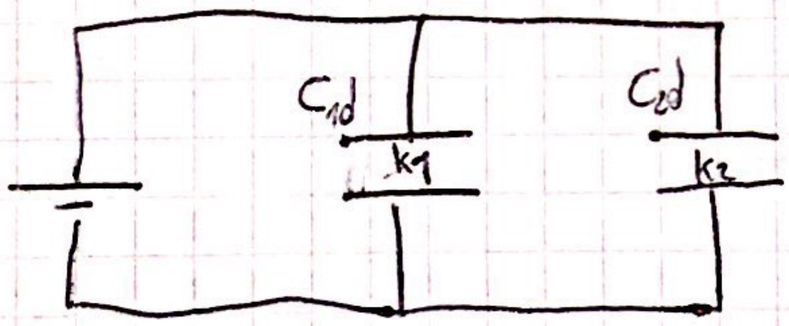
$\underline{R_{ac}}$




$R_{ac} \overset{?}{=} R_{ef} = R_3 + R_2 = 60\Omega$ ✓

5

i Se puede pensar como dos capacitores en paralelo




$$C_{eq} = C_{1d} + C_{2d}$$

$$C_{1d} = \frac{A \cdot \varepsilon_0}{2d} \cdot K_1 = \frac{A\varepsilon_0}{2d} \cdot \frac{\varepsilon_1}{\varepsilon_0} = \frac{A\varepsilon_1}{2d}$$

$$C_{2d} = \frac{A\varepsilon_0}{2d} \cdot K_2 = \frac{A\varepsilon_0}{2d} \cdot \frac{\varepsilon_2}{\varepsilon_0} = \frac{A\varepsilon_2}{2d}$$

$$C_{eq} = C_{1d} + C_{2d} = \frac{A}{2d}(\varepsilon_1 + \varepsilon_2)$$

ii Se puede pensar como dos capacitores en serie.

NOTA

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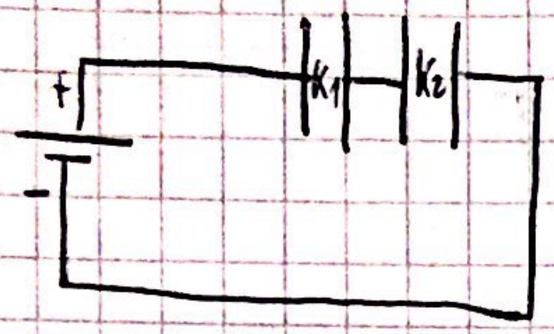
FECHA




$$C_1 = C_2 = \frac{\varepsilon_0 . A}{\frac{d}{2}} = \frac{2\varepsilon_0 A}{d}$$

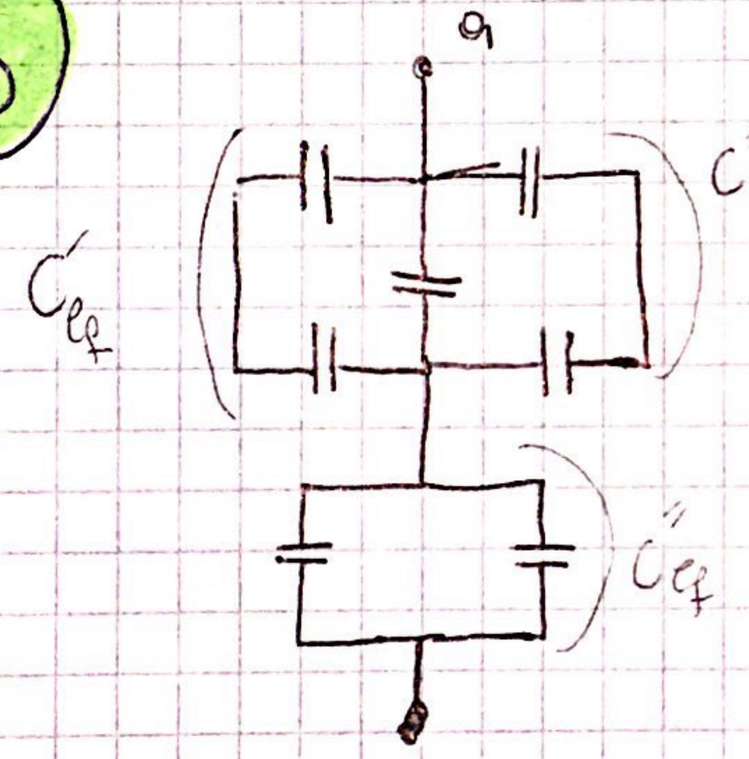
$$C_{1d} = \frac{2\varepsilon_0 A}{d} . K_1 = \frac{2\varepsilon_1 A}{d}$$

$$C_{2d} = \frac{2\varepsilon_0 A}{d} . K_2 = \frac{2\varepsilon_2 A}{d}$$

Entonces:

$$C_{ef} = \left(\frac{1}{C_{1d}} + \frac{1}{C_{2d}}\right)^{-1} = \frac{2A}{d}\left(\frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_2}\right)^{-1}$$

## 6

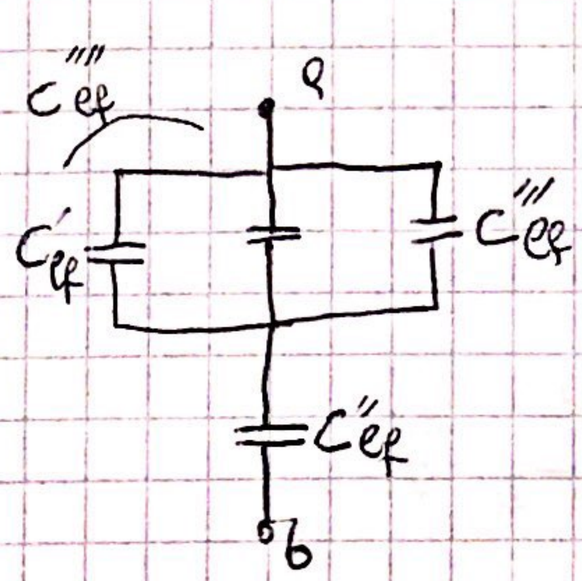



$$C'_{ef} = \left(\frac{1}{C_1} + \frac{1}{C_2}\right)^{-1} = \frac{C_1 . C_2}{C_1 + C_2}$$

$$C''_{ef} = C_2 + C_2 = 2C_2$$

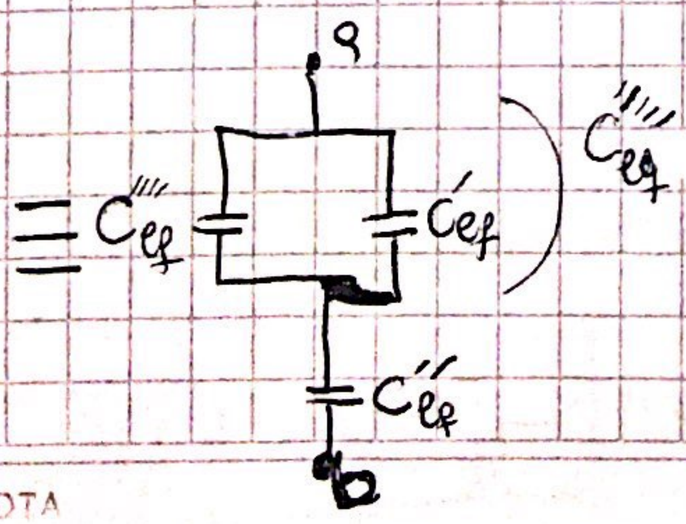
$$C'''_{ef} = C'_{ef} = \frac{C_1 C_2}{C_1 + C_2}$$

≡




$$C''''_{ef} = C'_{ef} + C_3$$

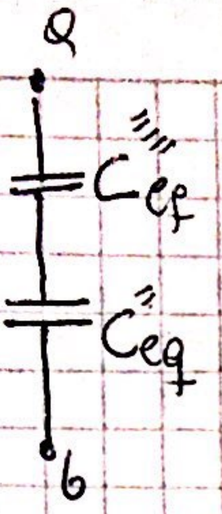
≡




$$C''''_{ef} = C'''_{ef} + C'_{ef}$$

NOTA

≡




$$C_{EQ} = \left(\frac{1}{C''_{eq}} + \frac{1}{C'_{eq}}\right)^{-1} = \frac{C''_{eq} \cdot C'_{eq}}{C''_{eq} + C'_{eq}}$$

$$C'_{eq} = \frac{50}{1}\,\frac{\mu F^2}{\mu F} = \frac{10}{3}\,\mu F$$

$$C''_{eq} = 20\mu F$$

$$C'''_{eq} = \frac{10}{3}\mu f$$

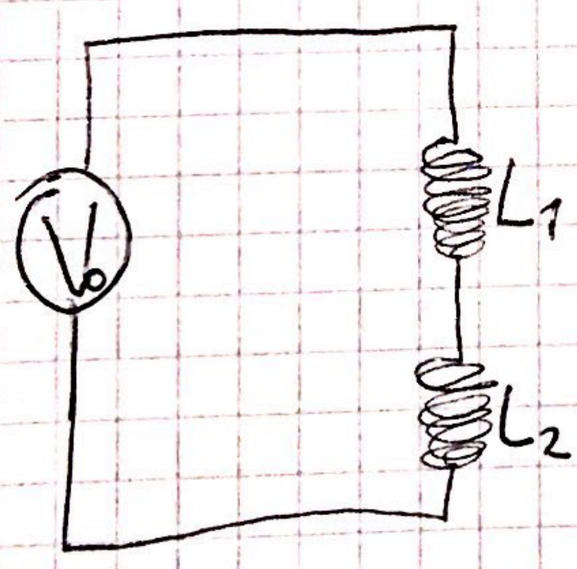
$$C''_{eq} = \frac{10}{3}\mu f + 2\mu f = \frac{16}{3}\mu F$$

$$C'''_{eq} = \frac{16}{3}\mu f + \frac{10}{3}\mu f = \frac{26}{3}\mu f$$

$$C_{EQ} = \frac{20\mu f \cdot \frac{26}{3}\mu F}{\frac{26}{3}\mu f + 20\mu f} = \frac{520}{3}\mu f \cdot \frac{3}{86}\mu f = \frac{520}{86}\mu f \approx 6{,}04\mu f$$

7

Serie




$$V_1 = -L_1 \frac{di}{dt}$$

$$V_2 = -L_2 \frac{di}{dt}$$

$$V = -L_{eq} \cdot \frac{di}{dt}$$

Pado que $V = V_1 + V_2$ :

$$L\frac{di}{dt} = L_1\frac{di}{dt} + L_2\frac{di}{dt} \Longrightarrow \boxed{L_{eq} = L_1 + L_2}$$

NOTA

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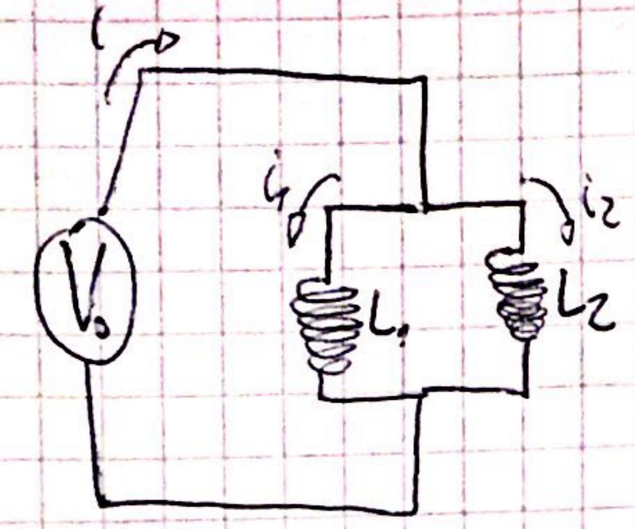
## Paralelo




$$i = i_1 + i_2 \Longrightarrow \frac{di}{dt} = \frac{di_1}{dt} + \frac{di_2}{dt}$$

$$V_0 = V_1 = V_2$$

↳ pues cuando llegan a $L_1, L_2$ respectivamente, no hay caída de voltaje

$$V_0 = -L_{ef}\frac{di}{dt} = -L_{ef}\left(\frac{di_1}{dt} + \frac{di_2}{dt}\right)$$

$$= -L_{ef}\left(-\frac{V_1}{L_1} - \frac{V_2}{L_2}\right) = L\left(\frac{V_0}{L_1} + \frac{V_0}{L_2}\right)$$

$$\Longrightarrow \quad V_0 = L_{eq}V_0\left(\frac{1}{L_1} + \frac{1}{L_2}\right)$$

$$\boxed{\frac{1}{L_{eq}} = \frac{1}{L_1} + \frac{1}{L_2}}$$



NOTA