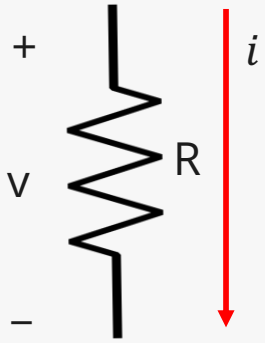
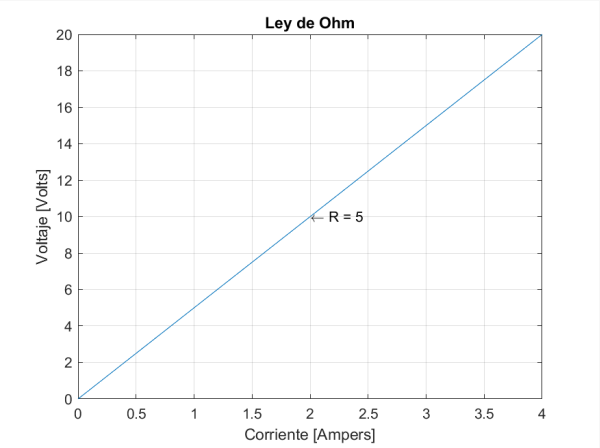
Ley de Ohm (Resistencia)

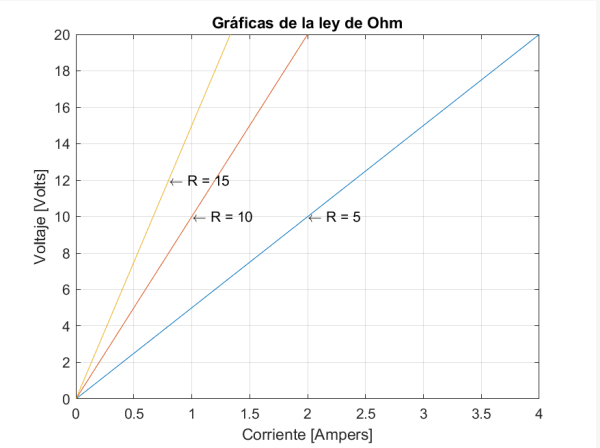
Se le denomina **resistencia eléctrica** a la oposición al flujo de corriente eléctrica a través de un conductor.

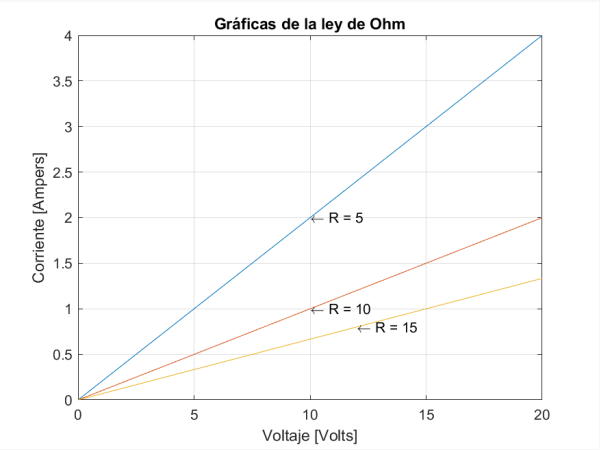


$v = iR$ Ley de Ohm

La ley de Ohm establece que el voltaje a través de una resistencia es directamente proporcional a la corriente que fluye a lo largo de esta.







$$I = \frac{1}{R}.v + 0$$

$$y = m.x + b$$

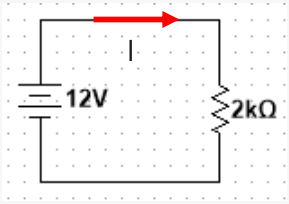
$$v = iR$$

$$i = \frac{v}{R}$$

$$p = vi$$

$$p = (iR)i = i^2R$$

$$p = v\left(\frac{v}{R}\right) = \frac{v^2}{R}$$

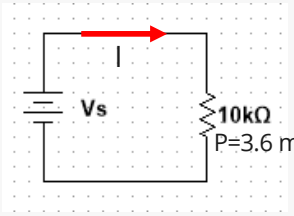


$$i = \frac{v}{R} = \frac{12}{2k\Omega} = 6mA$$

$$P = vi = (12\ volts)(6x10^{-3}) = 72\ mWatts = 0.072\ W$$

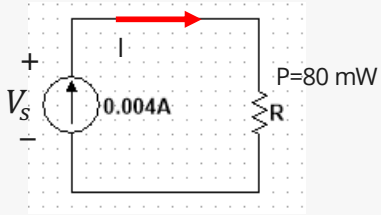
$$P = i^2R = (6x10^{-3})^2(2k) = 72\ mWatts = 0.072\ W$$

$$P = \frac{v^2}{R} = \frac{(12)^2}{2k} = 72\ mWatts = 0.072\ W$$



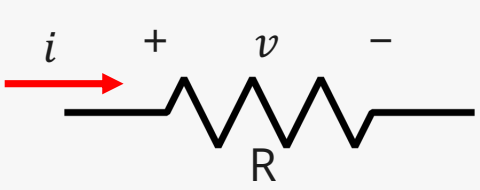
$p = i^2R$ ➡ $i = \sqrt{{}^{p}/_{R}} = \sqrt{{}^{3.6x10^{-3}}/_{10x10^{3}}} = 0.6\ mA$

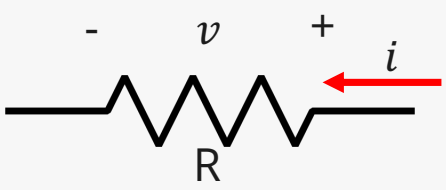
$p = vi$ ➡ $v = {}^{p}/_{i} = {}^{3.6x10^{-3}}/_{0.6x10^{-3}} = 6\ Volts$



$p = i^2R$ ➡ $R = {}^{p}/_{i^2} = {}^{80x10^{-3}}/_{(0.004)^2} = 5k\Omega$

$v = iR = (0.004)(5000) = 20\ volts.$





Las resistencias absorben potencia.

Elemento pasivo

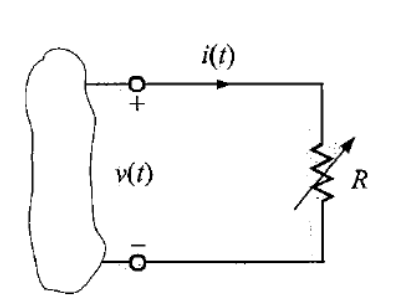
$p = vi = +$

Una fuente suministra potencia.

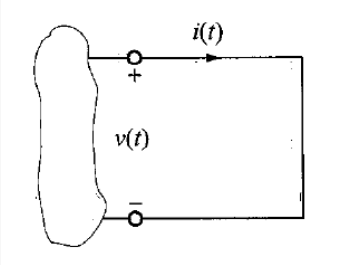
Elemento activo

$p = vi = -$

Corto Circuito y Circuito Abierto



Si $R \to 0$



$R = 0$

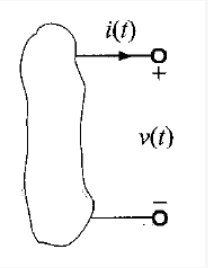
$V = 0$

i =?

$$V = Ri = (0)i = 0$$

$R = 0 \;\rightarrow\; V = 0 \rightarrow \;$ *Corto Circuito*

Si $R \to \infty$



$R = \infty$

i = 0

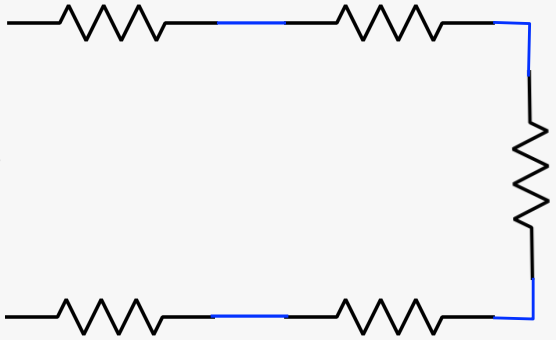
V =?

$$V = Ri \;\rightarrow\; i = \frac{V}{R} = \frac{V}{\infty} = 0$$

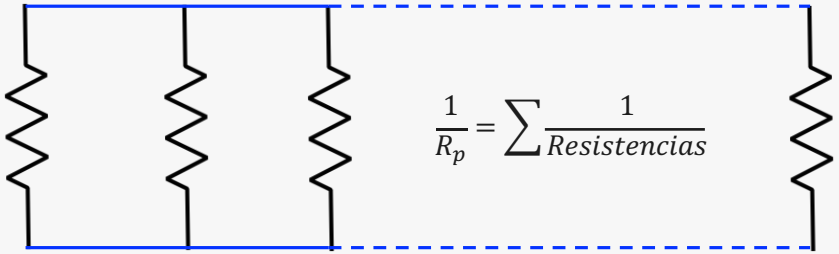
$R = \infty \rightarrow$ i = 0 $\rightarrow$ *Circuito Abierto*

Conexión de resistencias.

$R_s = \sum Resistencias$



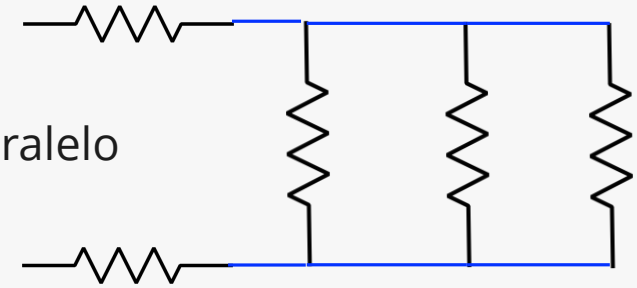
conexión en serie



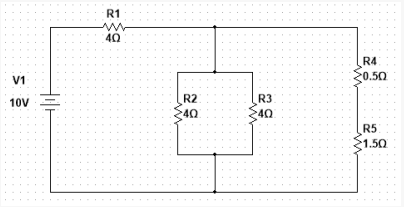
$\frac{1}{R_p} = \sum \frac{1}{Resistencias}$

Conexión en paralelo

conexión serie-paralelo

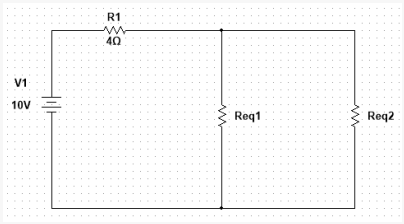


Análisis de circuitos

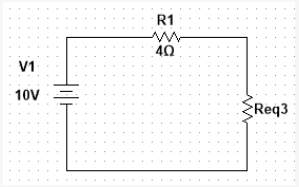


$$R_{eq1} = \frac{1}{\frac{1}{R_2}+\frac{1}{R_3}} = \frac{1}{\frac{1}{4}+\frac{1}{4}} = 2\Omega$$

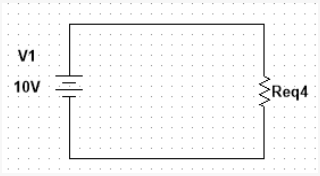
$$R_{eq2} = R_4 + R_5 = 0.5 + 1.5 = 2\Omega$$



$$R_{eq3} = \frac{1}{\frac{1}{R_{eq1}}+\frac{1}{R_{eq2}}} = \frac{1}{\frac{1}{2}+\frac{1}{2}} = 1\Omega$$



$$R_{eq4} = R_1 + R_{eq3} = 4 + 1 = 5\Omega$$



$$i_{Req4} = \frac{10V}{R_{eq4}} = \frac{10}{5} = 2\ Amp$$

$$i_{R1} = i_{Req3} = i_{Req4} = 2\ Amp$$

$$V_{R1} = i_{R1}R_1 = (2Amp)(4\Omega) = 8 \text{ volts}$$

$$V_{Req3} = i_{Req3}R_{eq3} = (2Amp)(1\Omega) = 2 \text{ volts}$$

$$V_{Req1} = V_{Req2} = V_{Req3} = 2 \text{ volts}$$

$$i_{Req1} = \frac{V_{Req1}}{R_{eq1}} = \frac{2V}{2\Omega} = 1\ Amp$$

$$i_{Req2} = \frac{V_{Req2}}{R_{eq2}} = \frac{2V}{2\Omega} = 1\ Amp$$

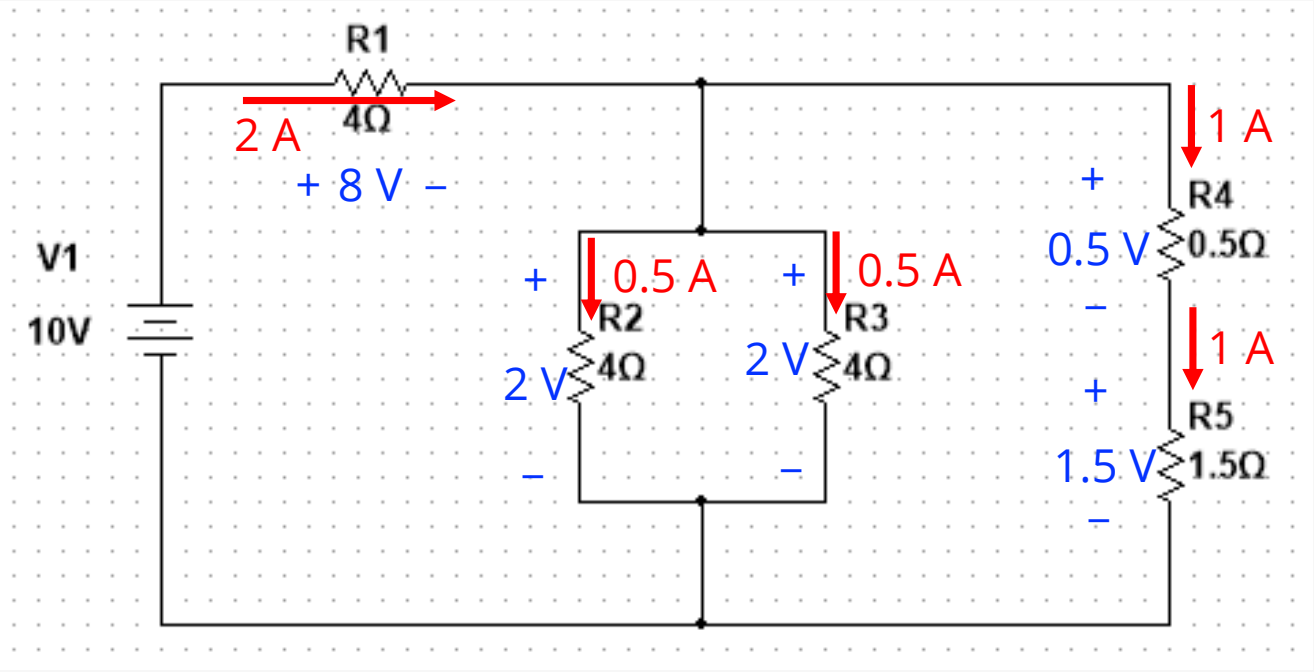
$$V_{R2} = V_{R3} = V_{Req1} = 2 \text{ volts}$$

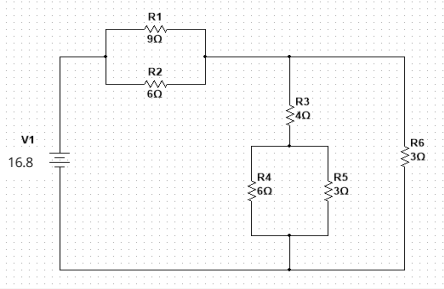
$$i_{R2} = \frac{V_{R2}}{R_2} = \frac{2V}{4\Omega} = 0.5\ Amp = i_{R3}$$

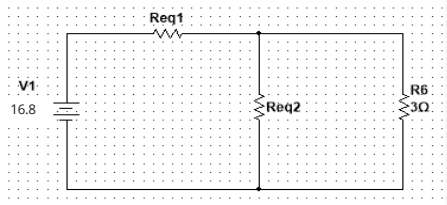
$$i_{R4} = i_{R5} = i_{Req2} = 1\ Amp$$

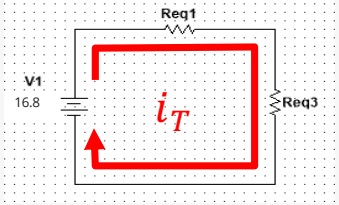
$$V_{R4} = i_{R4}R_4 = (1Amp)(0.5\Omega) = 0.5 \text{ volts}$$

$$V_{R5} = i_{R5}R_5 = (1Amp)(1.5\Omega) = 1.5 \text{ volts}$$


R1
4Ω
2 A
+ 8 V –
V1
10V
+
0.5 A
R2
4Ω
2 V
–
+
0.5 A
R3
4Ω
2 V
–
1 A
+
0.5 V
–
R4
0.5Ω
1 A
+
1.5 V
–
R5
1.5Ω







$$R_{eq1} = R_1 \parallel R_2 = 3.6\Omega$$

$$R_{eq2} = (R_4 \parallel R_5) + R_3 = 6\Omega$$

$$R_{eq3} = R_{eq2} \parallel R_6 = 2\Omega$$

$$i_T = \frac{V_1}{R_{eq1} + R_{eq3}} = \frac{16.8V}{3.6 + 2} = 3\ Amp$$

$$V_{Req1} = R_{eq1} i_T = (3.6\Omega)(3A) = 10.8\ volts$$

$$V_{R1} = V_{R2} = V_{Req1} = 10.8\ volts$$

$$i_{R1} = \frac{V_{R1}}{R_1} = \frac{10.8}{9} = 1.2\ Amp$$

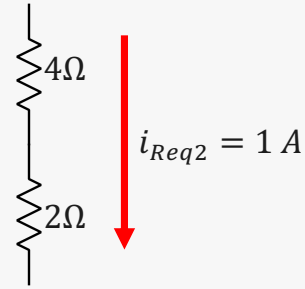
$$i_{R2} = \frac{V_{R2}}{R_2} = \frac{10.8}{6} = 1.8\ Amp$$

$$V_{Req3} = R_{eq3} i_T = (2\Omega)(3A) = 6\ volts$$

$$V_{Req2} = V_{R6} = V_{Req3} = 6\ volts$$

$$i_{Req2} = \frac{V_{Req2}}{R_{eq2}} = \frac{6}{6} = 1\ Amp$$

$$i_{R6} = \frac{V_{R6}}{R_6} = \frac{6}{3} = 2\ Amp$$

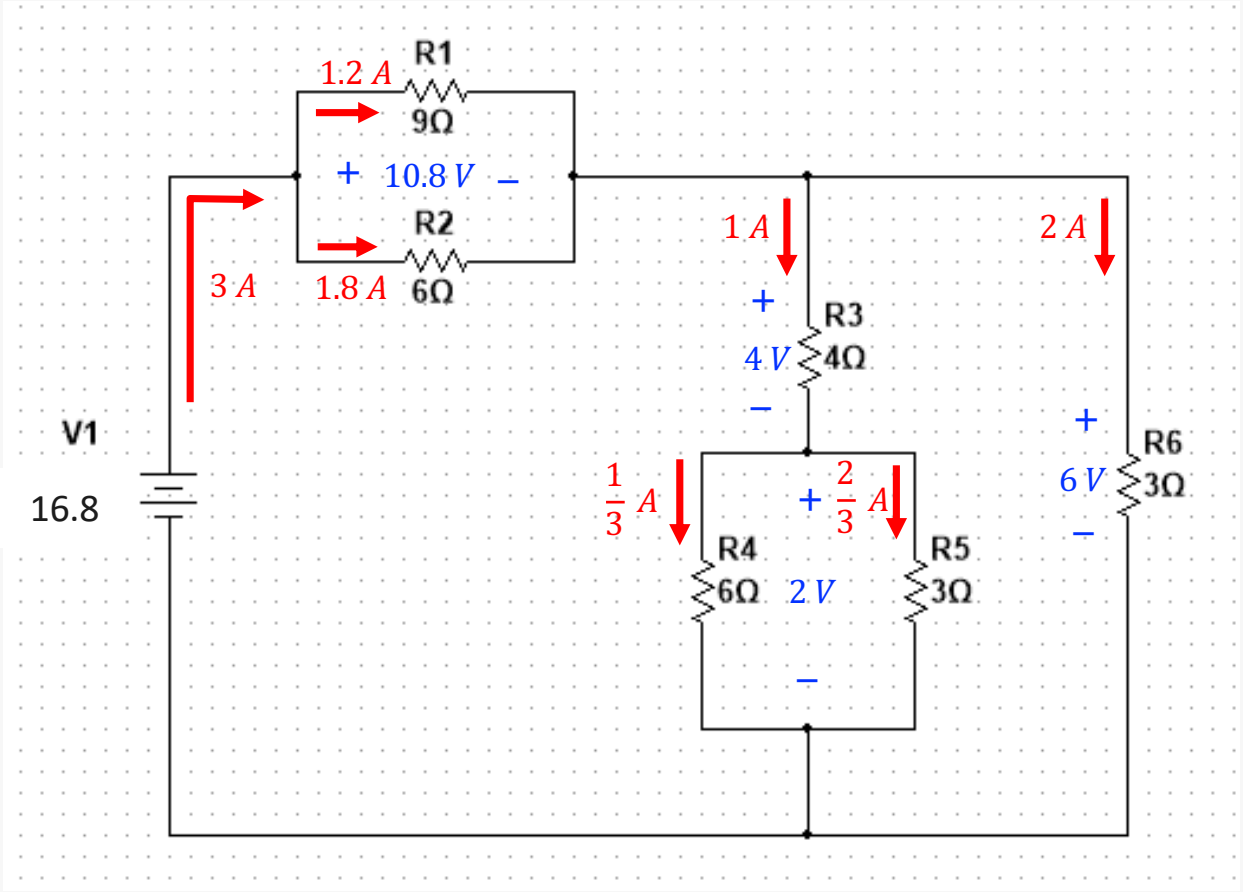


$$V_{R3} = R_3 i_{Req2} = (4\Omega)(1A) = 4\ volts$$

$$V_{R4} = V_{R5} = (R_4 \parallel R_5) i_{Req2} = (2\Omega)(1A) = 2volts$$

$$i_{R4} = \frac{V_{R4}}{R_4} = \frac{2}{6} = \frac{1}{3}\ Amp$$

$$i_{R5} = \frac{V_{R5}}{R_5} = \frac{2}{3} = \frac{2}{3}\ Amp$$


R1
1.2 A
9Ω
+ 10.8 V –
R2
3 A
1.8 A
6Ω
1 A
2 A
+
R3
4 V
4Ω
–
V1
16.8
1/3 A
+ 2/3 A
R4
6Ω
2 V
R5
3Ω
+
6 V
R6
3Ω
–