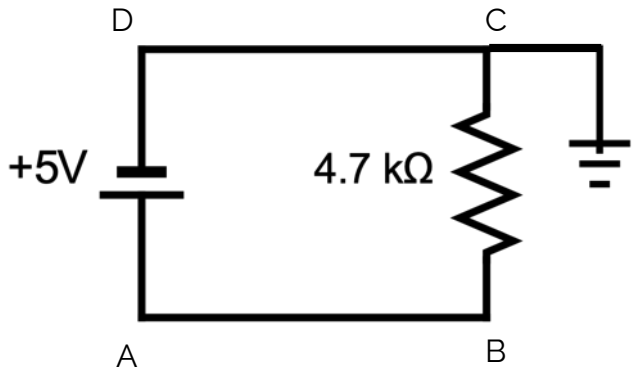
Circuitos eléctricos

Ejemplo simple



Cuánto vale

- V_A
- V_B
- V_C
- V_D
- $I_{A->B}$
- $I_{B->C}$
- $I_{C->D}$
- $I_{D->A}$
- $I_{C->B}$

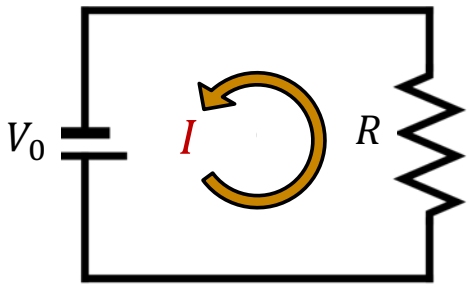
Calentamiento Joule

$L = P\,\Delta t$

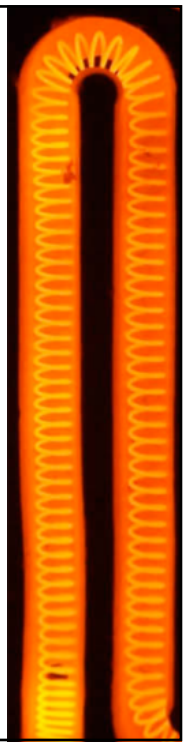
$L_{bat} = V\,\Delta Q$

$$P_{bat} = \frac{L_{bat}}{\Delta t} = V_0 \frac{\Delta Q}{\Delta t}$$

$$= V_0\, I = V_0\, \frac{V_0}{R}$$



$$P = \frac{{V_0}^2}{R} = I^2 R$$

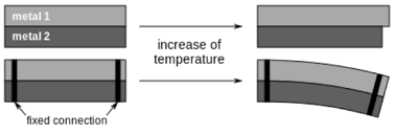


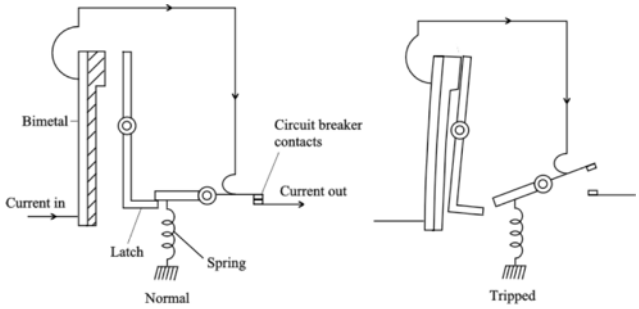
Potencia disipada por una resistencia

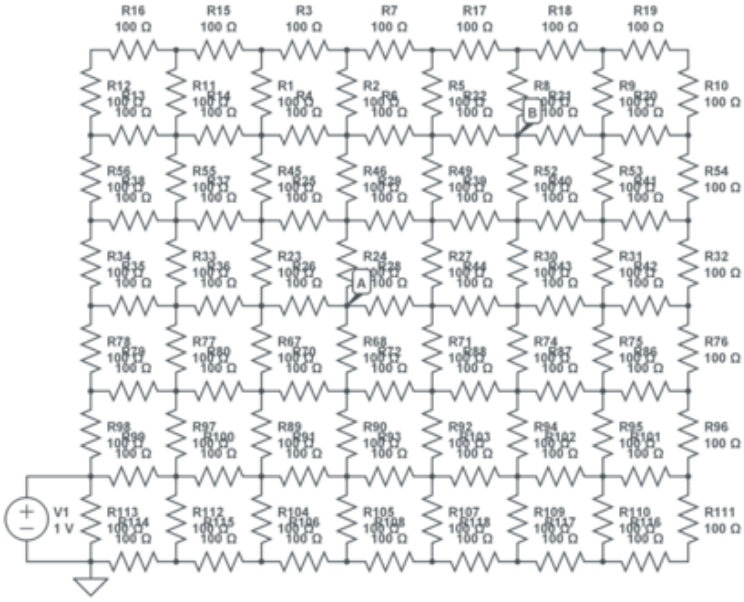
$$P = \frac{{V_0}^2}{R} = I^2 R$$

Aplicaciones

Fusibles y llaves termomagnética



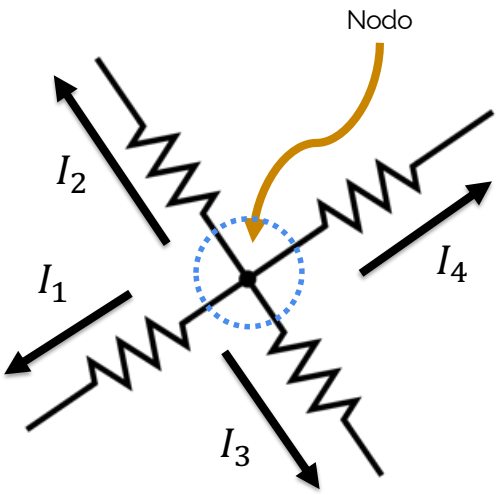




https://xkcd.com/356/

Ley de Kirchhoff: nodos

$$\oint \vec{j}\,\delta\vec{S} = -\frac{dq_{int}}{dt}$$



$$I_1 + I_2 + I_3 + I_4 = 0$$

Leyes de Kirchhoff

En cada nodo

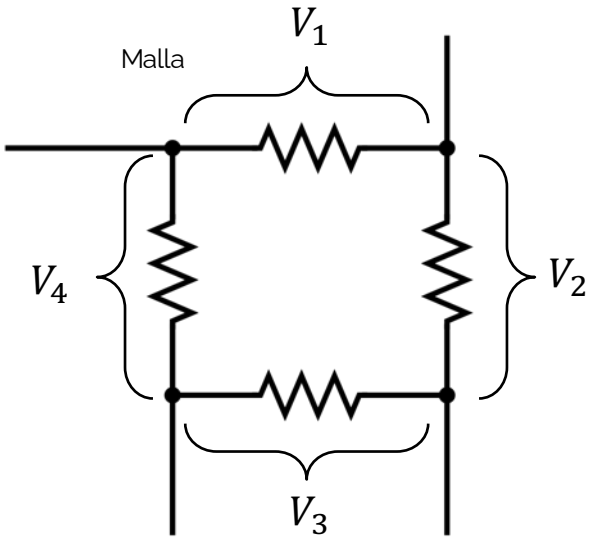
Todas las corrientes salen o entrar. Como con el alcohol, no mezclar.

$$\sum_{k=1}^{N} I_k = 0$$

La carga se conserva y no se acumula en los nodos.

Ley de Kirchhoff: mallas

$$\vec{\nabla} \times \vec{E} = 0$$



$$V_1 + V_2 + V_3 + V_4 = 0$$

Leyes de Kirchhoff

En cada nodo

Todas las corrientes salen o entrar.
Como con el alcohol, no mezclar.

$$\sum_{k=1}^{N} I_k = 0$$

La carga se conserva y no se acumula en los nodos.

En cada malla

Todas las caídas de potencial en el mismo sentido.
Como con el alcohol, no mezclar.

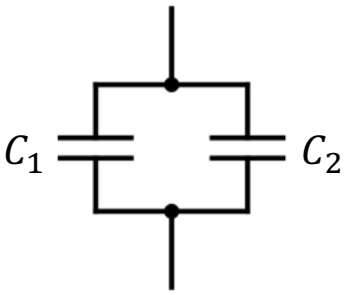
$$\sum_{k=1}^{N} V_k = 0$$

El campo eléctrico es conservativo

Reducciones simples de circuitos

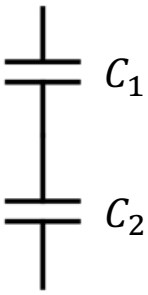
Capacitores

Paralelo

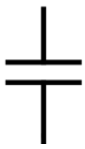


$$C_{eq} = C_1 + C_2$$

Serie



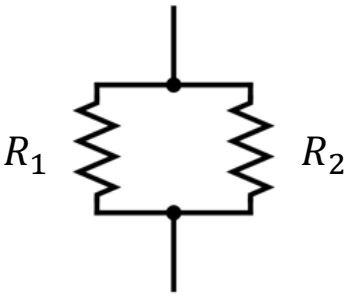
$$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2}$$



Reducciones simples de circuitos

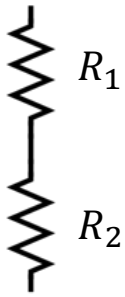
Resistencias

Paralelo

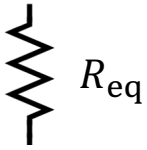


$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$$

Serie



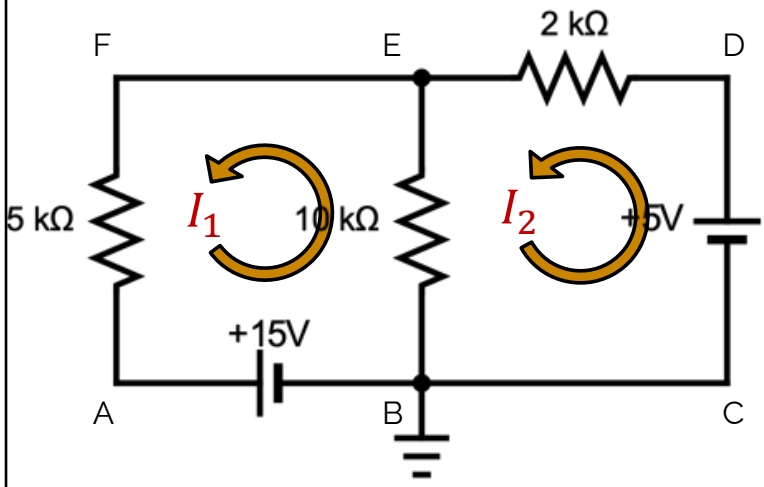
$$R_{eq} = R_1 + R_2$$



Método de mallas

Ejemplo mas complejo

$$V_{AB} = V_A - V_B$$



Malla 2

$$V_{BC} + V_{CD} + V_{DE} + V_{EB} = 0$$

Malla 1

$$V_{AB} + V_{BE} + V_{EF} + V_{FA} = 0$$