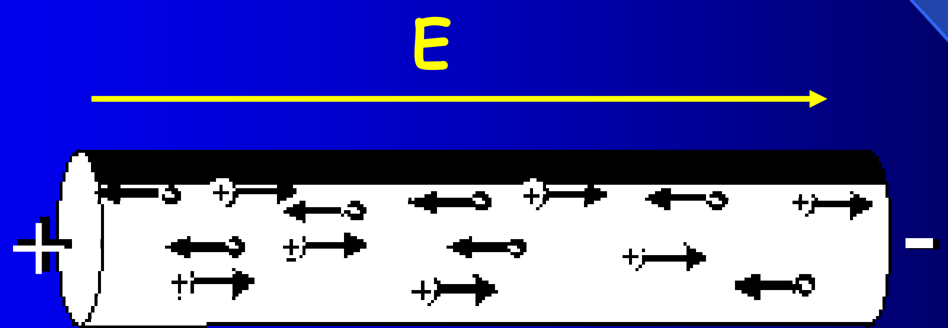
Electrodinámica

En un conductor sometido a un campo eléctrico, se observa un movimiento de cargas libres en la superficie del conductor. Por razones convencionales se ha establecido como corriente eléctrica al flujo de cargas positivas por unidad de tiempo.



$$I = \Delta q / \Delta t$$

$$I = n\,e\,v\,A$$

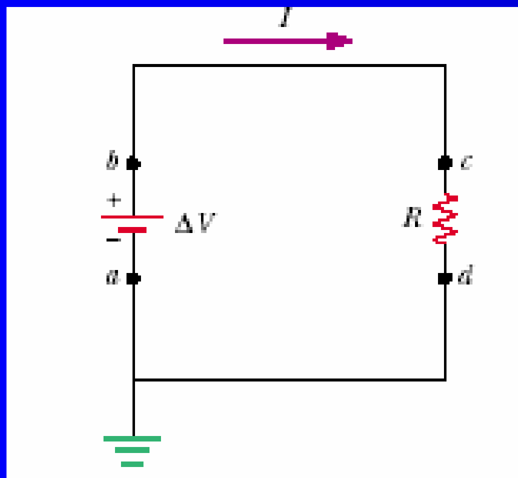
n = N° portadores de carga
e = carga del electrón
v = velocidad promedio
A = área sección transversal

$$I_{av} = \frac{\Delta Q}{\Delta t}$$

$$I = \frac{dQ}{dt}$$

En SI la unidad de corriente es el Ampere

$$1\ \mathrm{A} = \frac{1\ \mathrm{C}}{1\ \mathrm{s}}$$



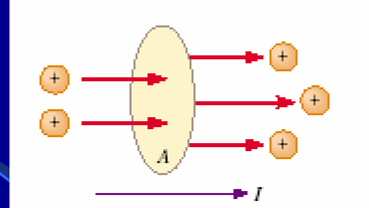
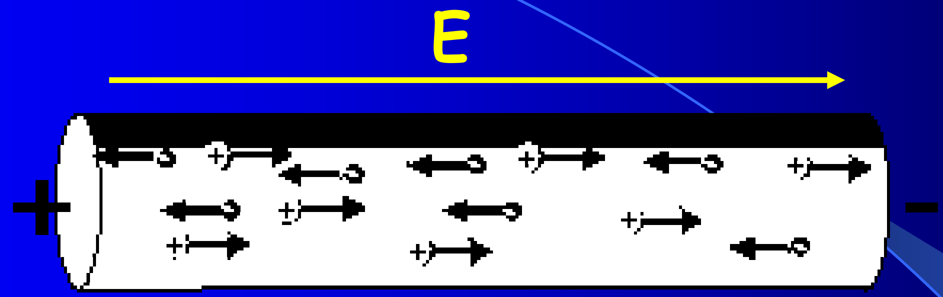


Figure 27.1 Charges in motion through an area *A*. The time rate at which charge flows through the area is defined as the current *I*. The direction of the current is the direction in which positive charges flow when free to do so.

Se le asigna ala corriente la misma dirección del flujo de cargas positivas

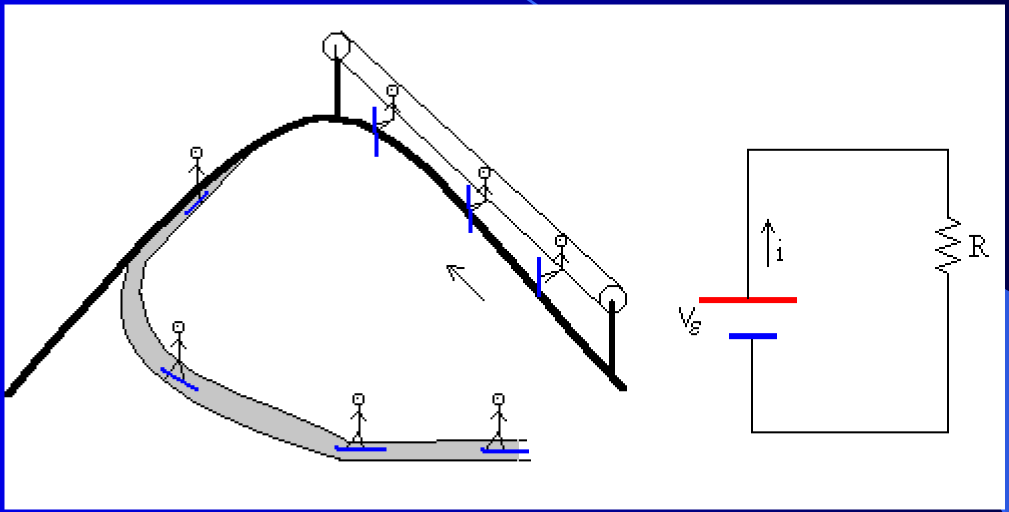
LEY de OHM



$$\left.\begin{array}{l} I \;\alpha\; \Delta V \\ \\ I \;\alpha\; 1/R \end{array}\right\} \quad I = \frac{\Delta V}{R}$$

$$\boxed{I = \Delta q \,/\, \Delta t}$$

$$\text{Flujo} = \frac{\text{Volumen}}{\text{tiempo}}$$

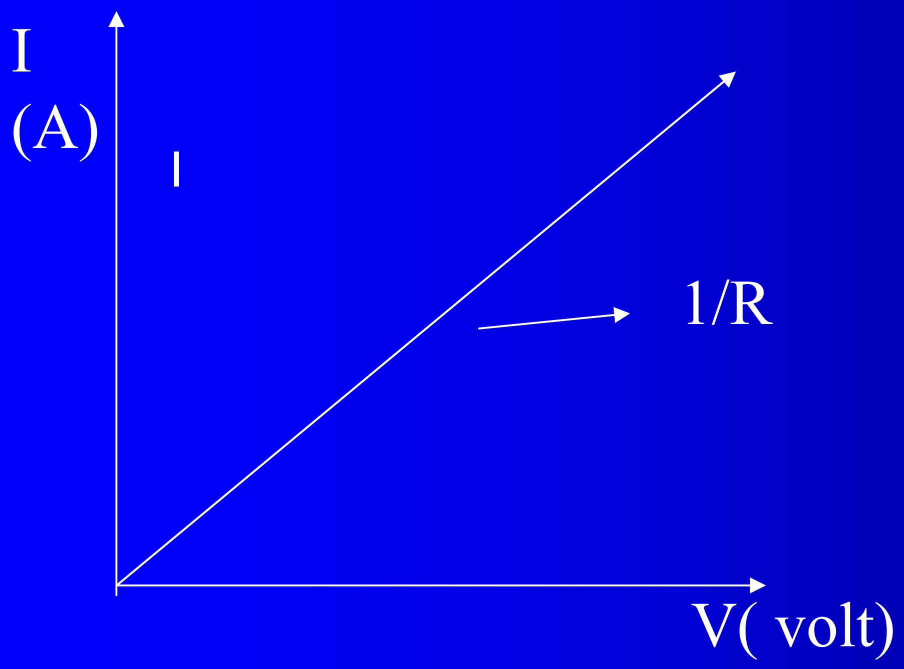


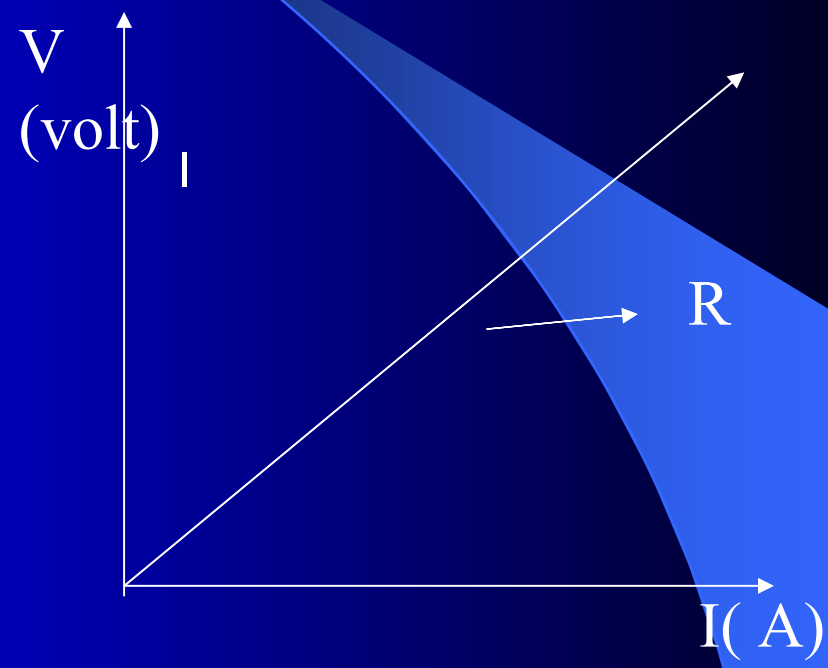
$$I = \frac{\Delta q}{\Delta t}$$

Conductores Ohmicos

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

$$V = I\,R$$





$$1/R = G$$

RESISTENCIA ELÉCTRICA

Cu

Cu

$R\ \alpha\ l$

Cu

Cu

$R\ \alpha\ 1/A$

Cu

Al

$R\ \alpha\ \rho$

$$\boxed{R = \rho \frac{l}{A}}$$

$$\boxed{R = \frac{\rho\, l}{A}}$$

$$\boxed{G = \frac{1}{R}}$$

^^^^^^

Ohm [Ω]

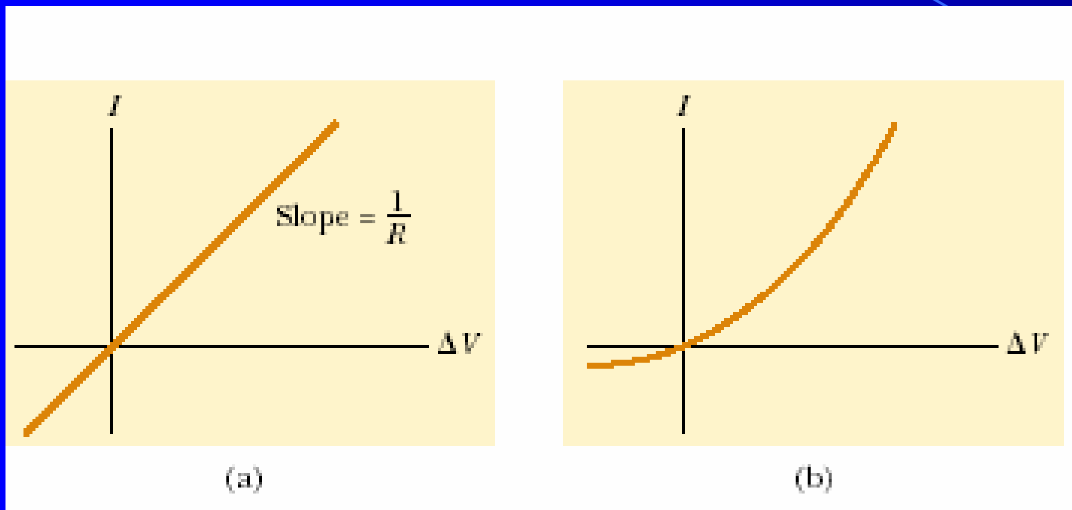
G = conductancia

Siemens

ρ = resistividad

l= largo

A =área sección transversal



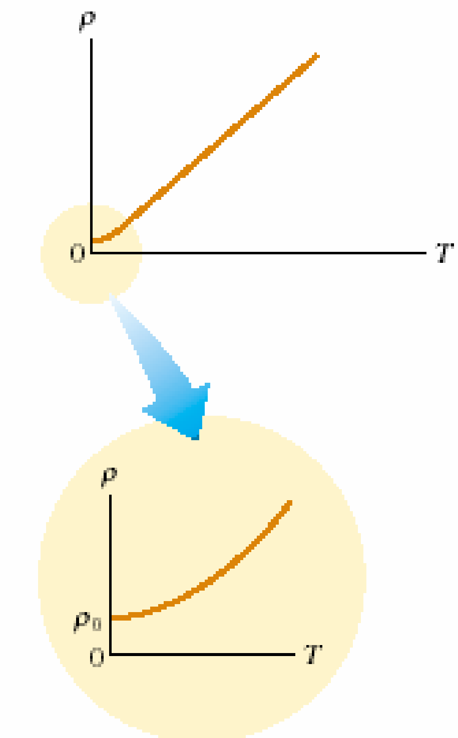


Figure 27.10 Resistivity versus temperature for a metal such as copper. The curve is linear over a wide range of temperatures, and ρ increases with increasing temperature. As T approaches absolute zero (inset), the resistivity approaches a finite value ρ_0.

TABLE 27.2 Color Coding for Resistors

Color	Number	Multiplier	Tolerance
Black	0	1	
Brown	1	10^1	
Red	2	10^2	
Orange	3	10^3	
Yellow	4	10^4	
Green	5	10^5	
Blue	6	10^6	
Violet	7	10^7	
Gray	8	10^8	
White	9	10^9	
Gold		10^{-1}	5%
Silver		10^{-2}	10%
Colorless			20%

Amarillo rojo naranja

$$42\times10^3\Omega = 42K\Omega$$

TABLE 27.1 Resistivities and Temperature Coefficients of Resistivity for Various Materials

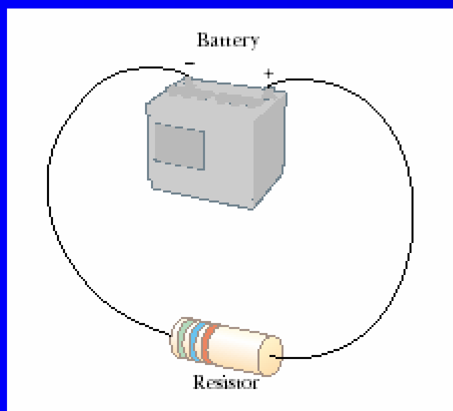
Material	Resistivity[a] $(\Omega \cdot m)$	Temperature Coefficient $\alpha[(°C)^{-1}]$
Silver	1.59×10^{-8}	3.8×10^{-3}
Copper	1.7×10^{-8}	3.9×10^{-3}
Gold	2.44×10^{-8}	3.4×10^{-3}
Aluminum	2.82×10^{-8}	3.9×10^{-3}
Tungsten	5.6×10^{-8}	4.5×10^{-3}
Iron	10×10^{-8}	5.0×10^{-3}
Platinum	11×10^{-8}	3.92×10^{-3}
Lead	22×10^{-8}	3.9×10^{-3}
Nichrome[b]	1.50×10^{-6}	0.4×10^{-3}
Carbon	3.5×10^{-5}	-0.5×10^{-3}
Germanium	0.46	-48×10^{-3}
Silicon	640	-75×10^{-3}
Glass	10^{10} to 10^{14}	
Hard rubber	$\approx 10^{13}$	
Sulfur	10^{15}	
Quartz (fused)	75×10^{16}	

[a] All values at 20°C.

[b] A nickel–chromium alloy commonly used in heating elements.

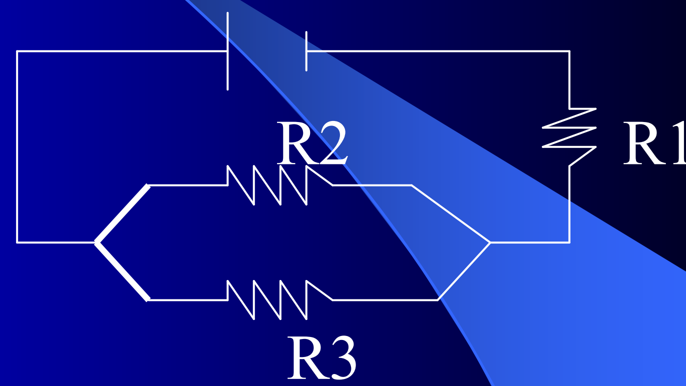
CIRCUITO ELÉCTRICO

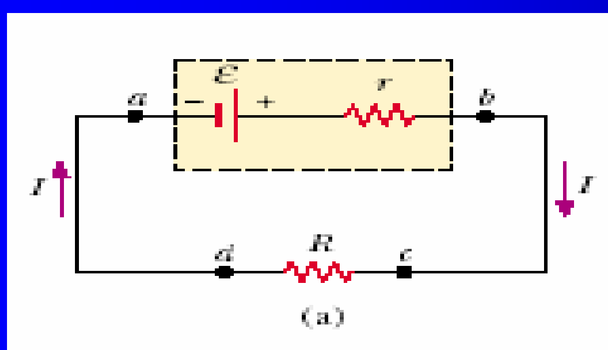
fem fuente de energía (pila ,batería , red domiciliaria)



$\mathcal{E} = \Delta V$

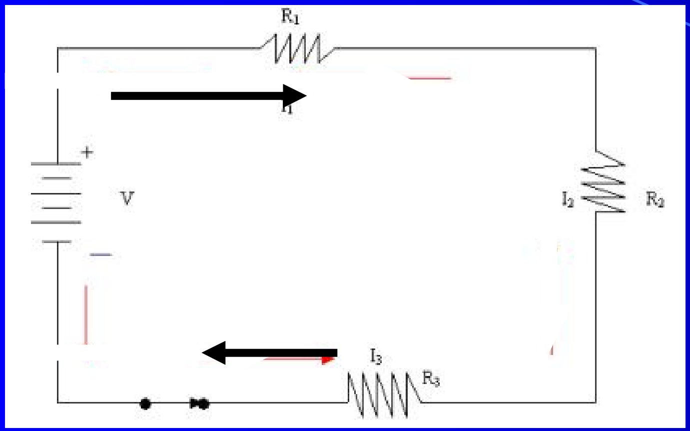
$\mathcal{E}$ = **10 Volt**



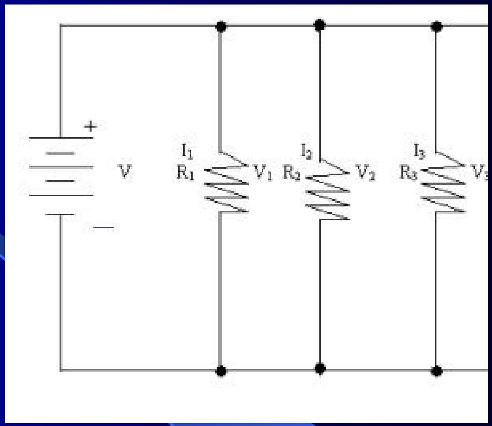


$$\Delta V = \mathcal{E} - Ir$$

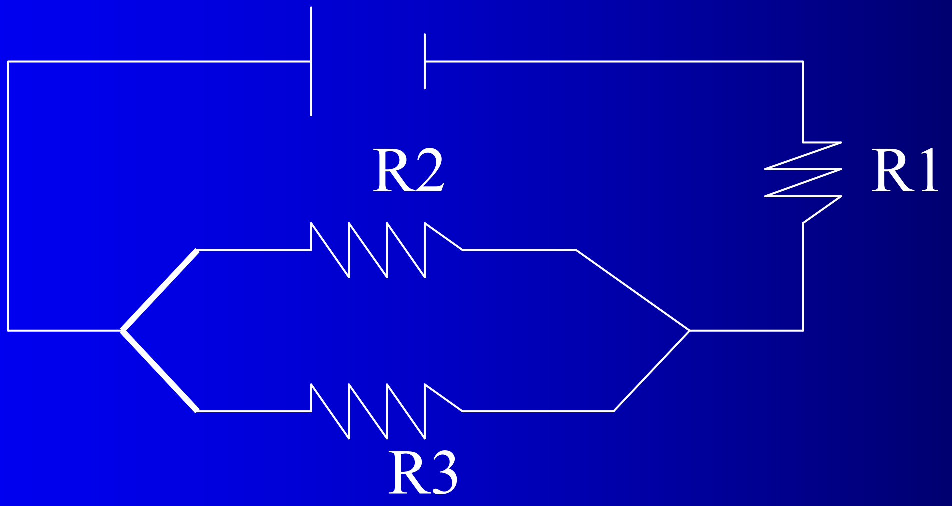
Circuito R en serie

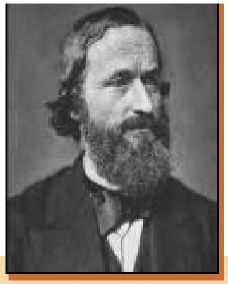


Circuito R en paralelo



$\Delta V = 10$ Volt





Gustav Kirchhoff (1824–1887)

1^{era} Ley Teorema de la trayectoria

♣La suma de las diferencias de de potenciales a traves de todos los elementos del circuito en un circuito cerrado debe ser cero

$$\sum_{\substack{\text{closed}\\\text{loop}}} \Delta V = 0$$

$$\boxed{\Sigma\mathcal{E} = \Sigma\, IR}$$

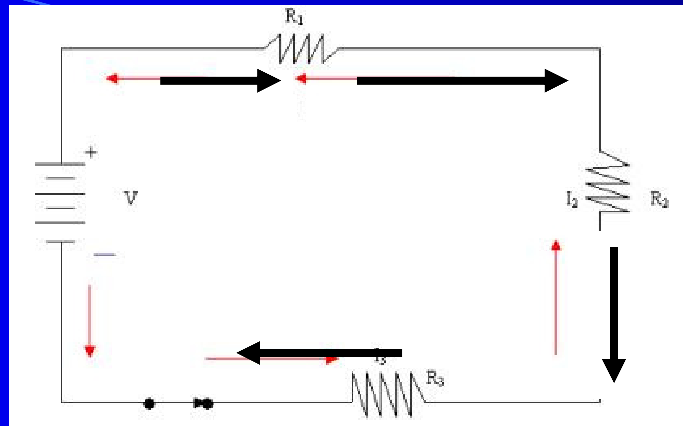
$$\boxed{\Sigma\mathcal{E} - \Sigma\, IR = 0}$$

2^{da} Ley de los nodos

♣ La suma de las corrientes que entran a un nodo es igual a la suma de las corrientes que salen del nodo

$$\sum I_{\text{in}} = \sum I_{\text{out}}$$

$$I_1 = I_2 + I_3$$



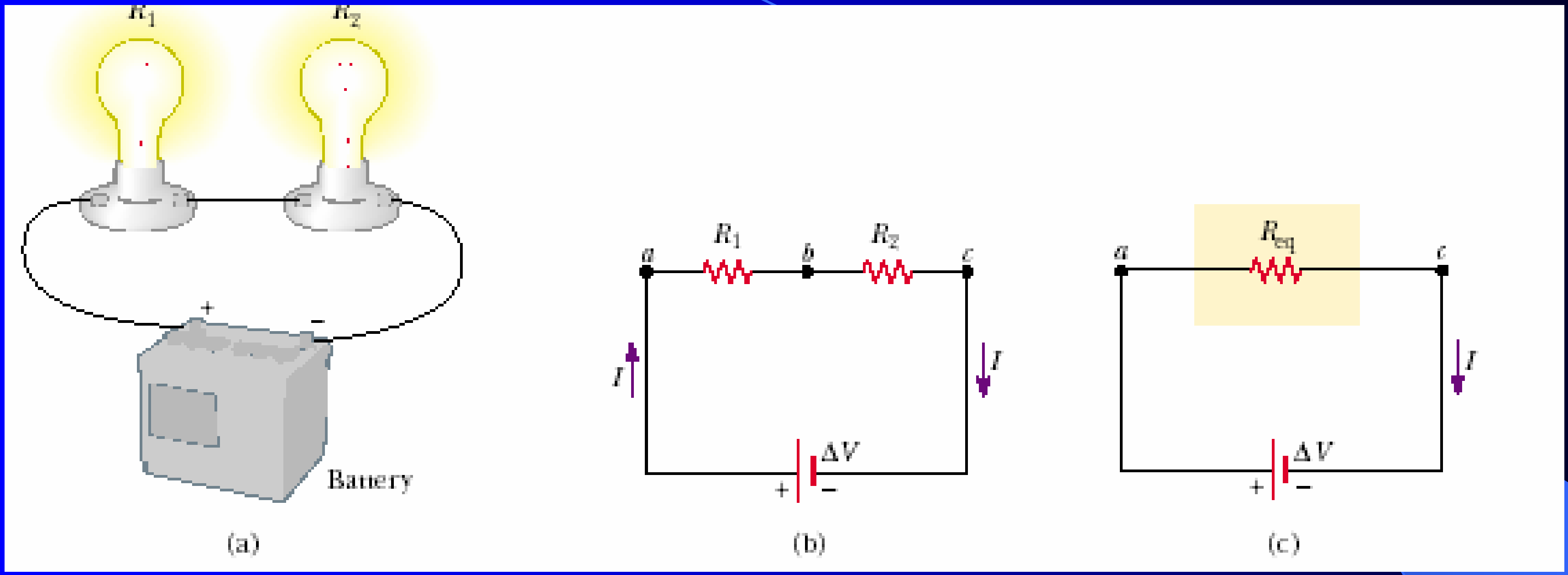
$\boxed{V = I\,R}$

$\boxed{I_{total} = I_1 = I_2 = I_3}$

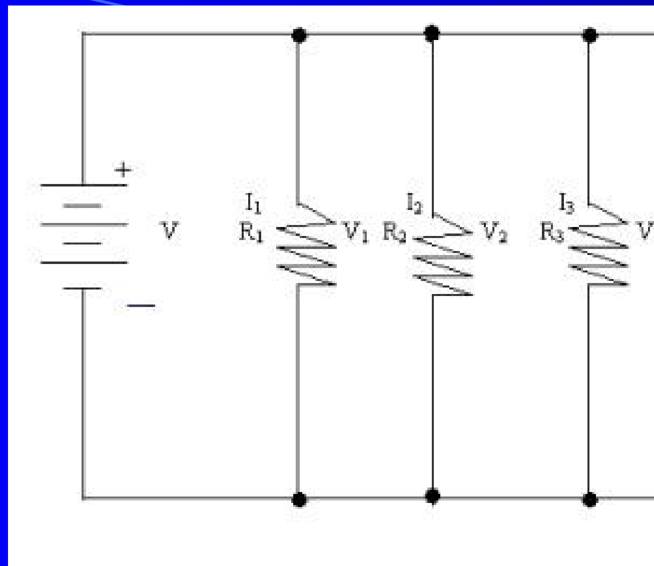
$$V_{total} = V_1 + V_2 + V_3$$

$$I\,R_{total} = I_1R_1 + I_2R_2 + I_3R_3 \quad / \quad I$$

$$\boxed{R_{total} = R_1 + R_2 + R_3}$$



R_1
R_2
+
−
Battery
(a)
R_1
R_2
a
b
c
I
I
ΔV
+
−
(b)
R_{eq}
a
c
I
ΔV
+
−
(c)



$$I = V / R$$

$$V_{total} = V_1 = V_2 = V_3$$

$$I\ total = I_1 + I_2 + I_3$$

$$\frac{V_{total}}{R_{total}} = \frac{V_1}{R_1} + \frac{V_2}{R_2} + \frac{V_3}{R_3} \quad \Big/ \; V$$

$$\frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

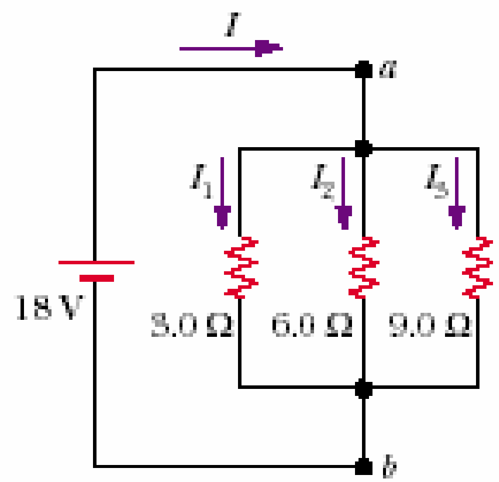


Figure 28.7 Three resistors connected in parallel. The voltage across each resistor is 18 V.

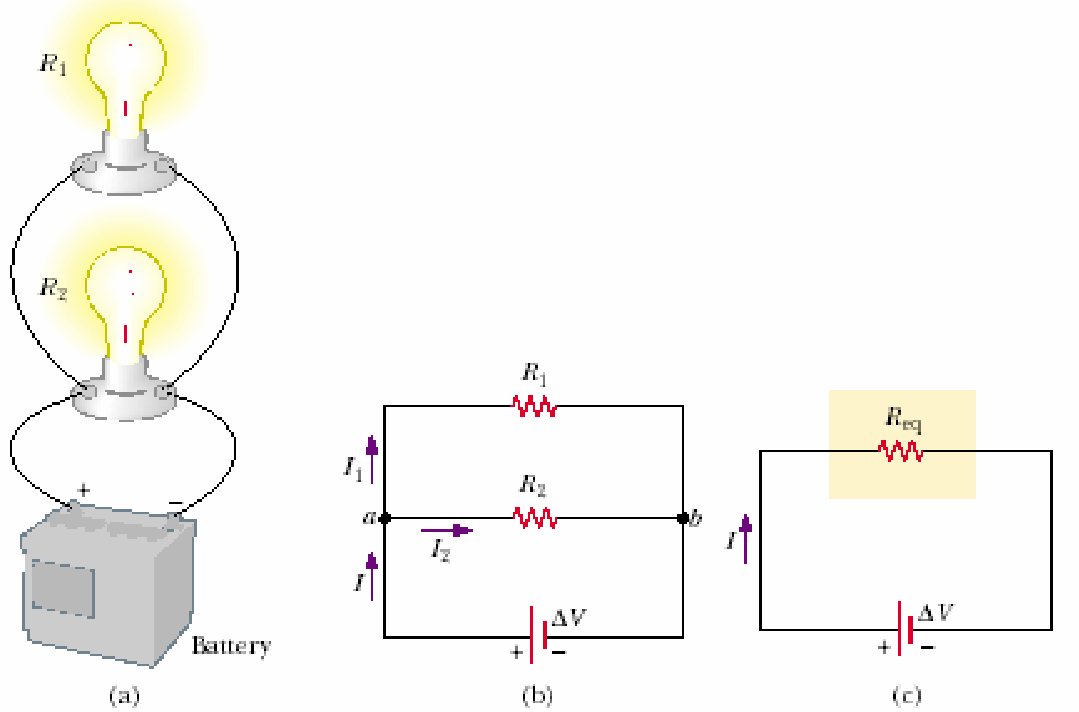
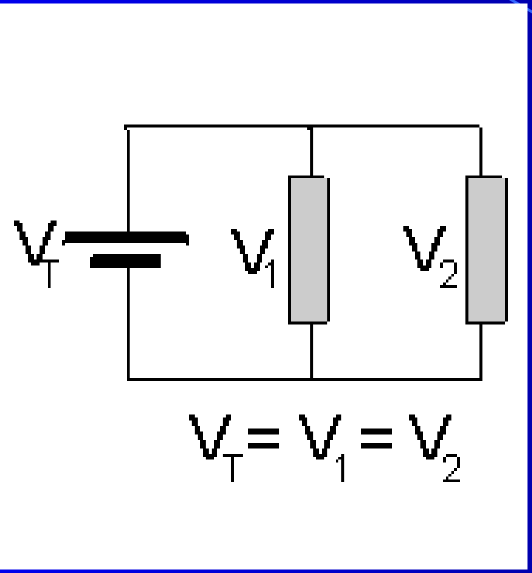


Figure 28.5 (a) A parallel connection of two resistors R_1 and R_2. The potential difference across R_1 is the same as that across R_2. (b) Circuit diagram for the two-resistor circuit. (c) The resistors replaced with a single resistor having an equivalent resistance $R_{eq} = (R_1^{-1} + R_2^{-1})^{-1}$.

paralelo



En el caso de conexión en paralelo la diferencia de potencial es la misma.

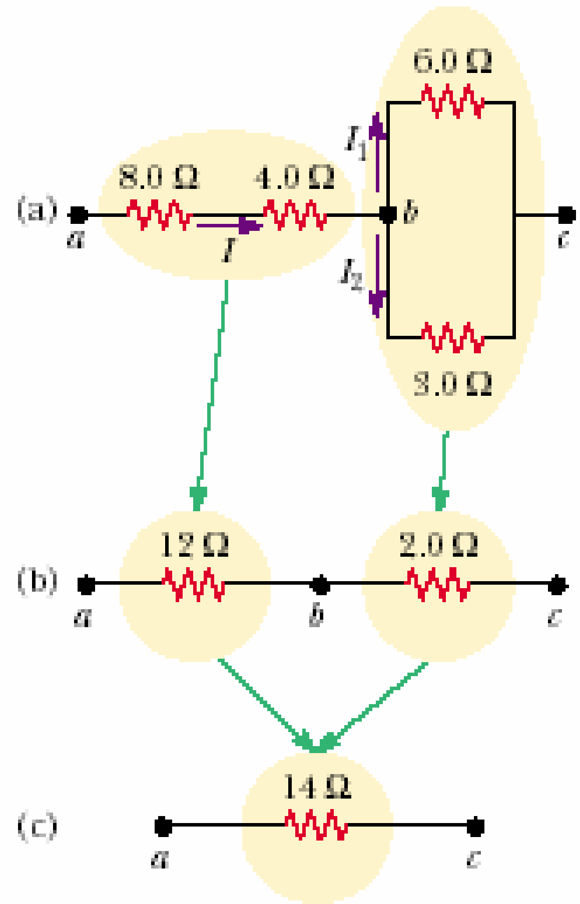
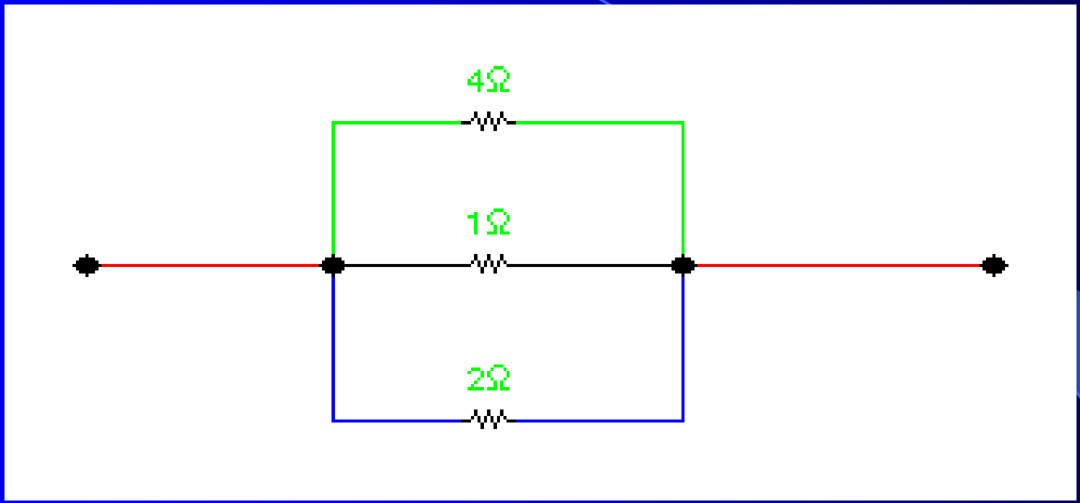


Figure 28.6

Resistencias en paralelo



$$\frac{1}{Rt} = \frac{1}{4} + \frac{1}{1} + \frac{1}{2} \left[\frac{1}{\Omega}\right]$$

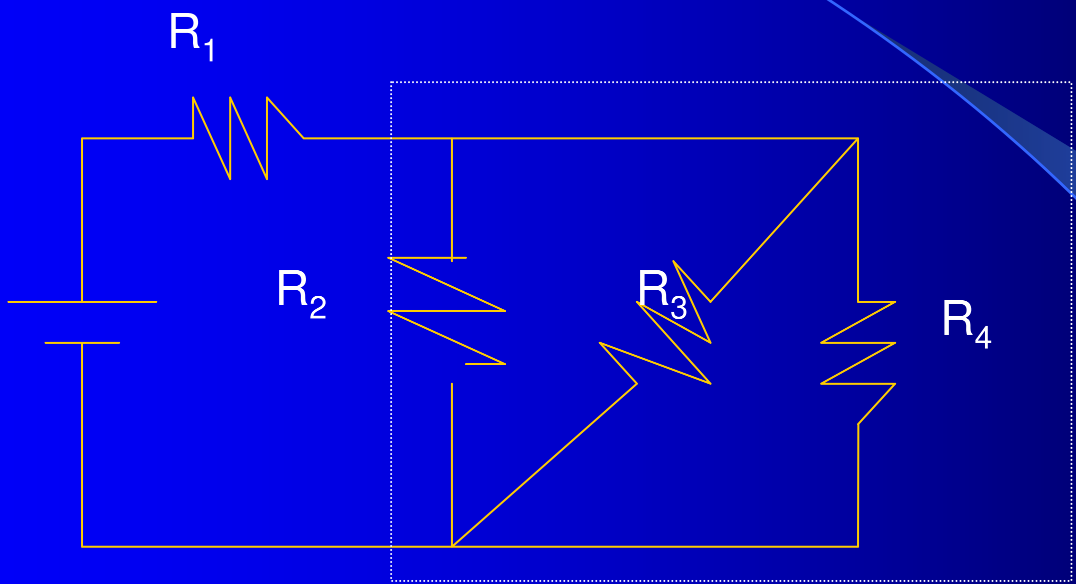
$$\boxed{\frac{1}{Rt} = \frac{1+4+2}{4}}$$

$$\boxed{Rt = 4/7\ \Omega}$$

$$\boxed{Rt = 0{,}57\ \Omega}$$

¿Cuál es la resistencia total del circuito?

$R_1 = 100\ \Omega$, $R_2 = 50\ \Omega$, $R_3 = 25\ \Omega$, $R_4 = 75\ \Omega$

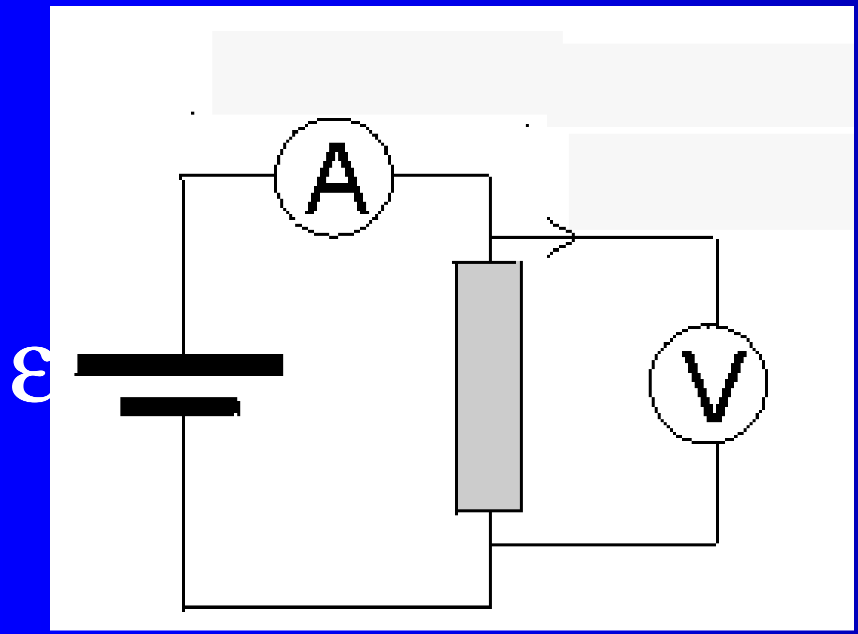


$1/Re = 1/R_2 + 1/R_3 + 1/R_4$

$= 1/50 + 1/25 + 1/75$ $\quad \dfrac{1}{Re} = \dfrac{3+6+2}{150}$

$Re = \dfrac{150}{11} \rightarrow 13{,}63\ \Omega$

$\boxed{R\ t = 1\ 00 + 13{,}63 = 113{,}63\Omega}$



A: amperímetro,
se conecta en serie.

V: voltímetro se conecta en paralelo

I = corriente en amperes (coulomb/seg)
V = voltaje en volts (joules/coulomb)

Energía Eléctrica y Potencia

$$\Delta U = q\,\Delta V.)$$

La rapidez de pérdida de energía en la resistencia

$$\frac{\Delta U}{\Delta t} = \frac{\Delta Q}{\Delta t}\Delta V = I\,\Delta V$$

$$\mathcal{P} = I\,\Delta V$$

La unidad de potencia SI = watts

$$\mathcal{P} = I^2 R = \frac{(\Delta V)^2}{R}$$

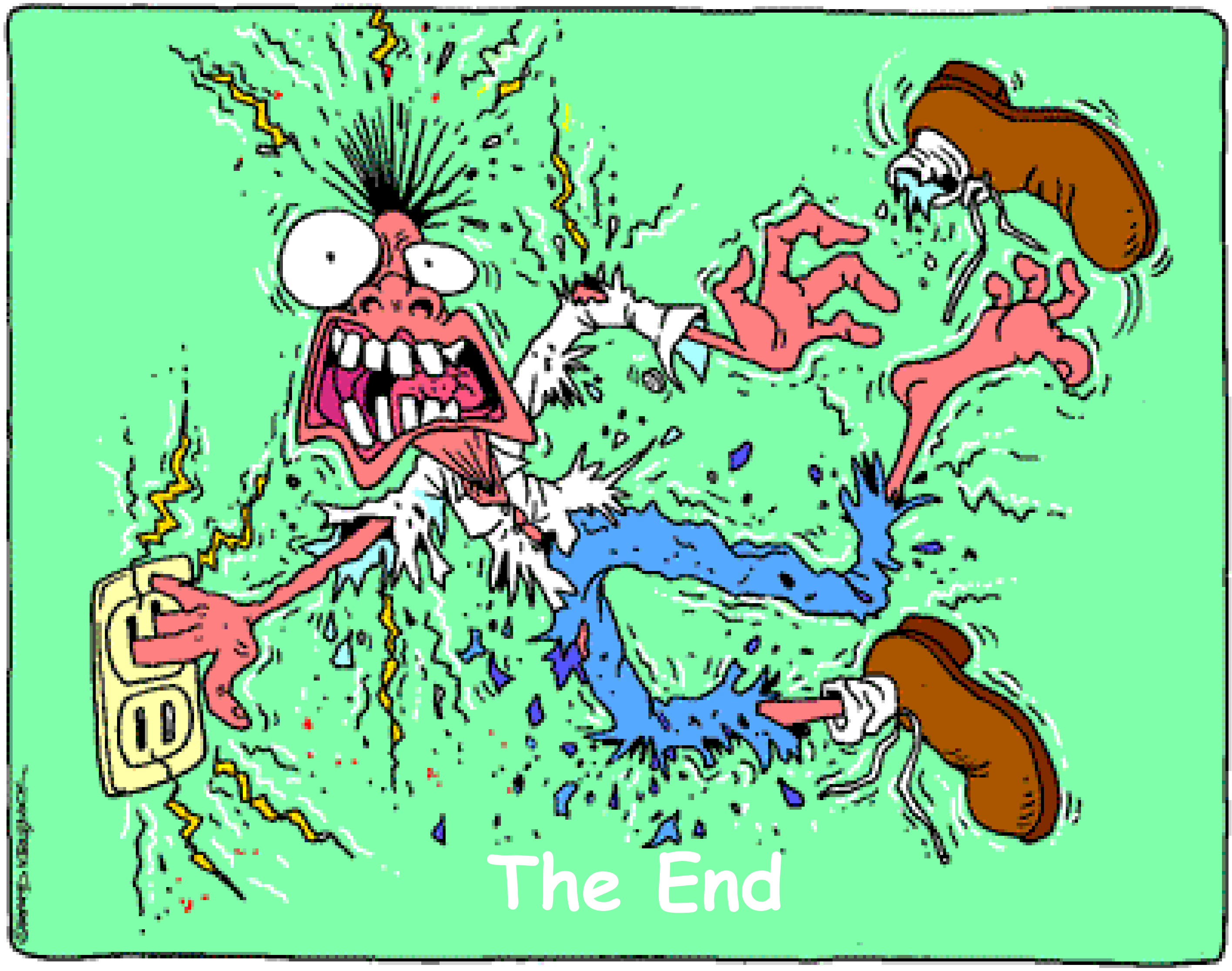
$$I = \frac{\Delta V}{R}$$

$$\mathcal{P} = I\,\Delta V$$

$$\mathcal{P} = I^2R$$

Figure 27.15 Power companies transfer electrical energy at high potential differences.

$$\mathcal{P} = I\,\Delta V$$


The End