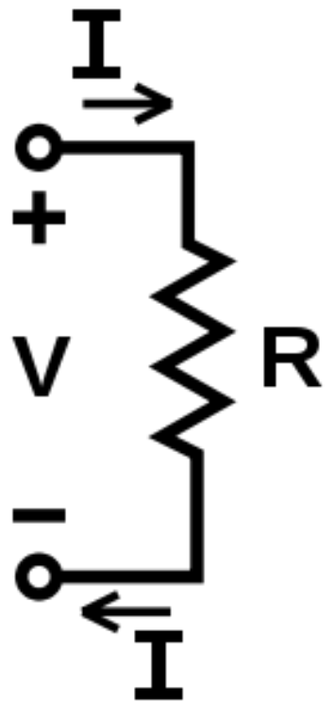
Ohm's Law (reminder)



- **V** is **Voltage Drop**, the **Potential Difference** between two ends of a wire (or resistor, light bulb etc). **V** is the difference of electric potential energies of a unit charge between two points. Measured in **Volts [V]** (Joule per Coulomb): **1V=1J/C**

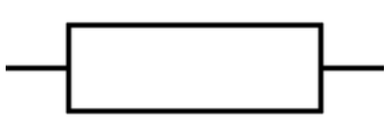
- **I** is **Electric Current**, the total charge flowing through the wire in 1 sec. Measured in **Amperes [A]** (Coulomb per second) : **1A=1C/s**

- **R** is **Resistance** of the wire. Measured in **Ohms [Ω]. 1Ω=1V/A**

Ohm's Law: the current through a conductor between two points is directly proportional to the voltage across the two points. The voltage is, therefore, proportional to the current.

$$V = I \cdot R$$

The coefficient of proportionality is called **resistance** of the conductor



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

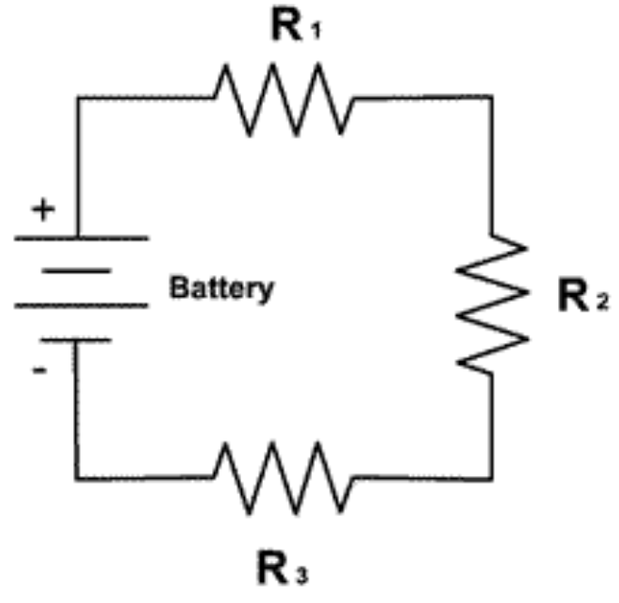
Series and Parallel Circuits

Series connection

Currents are the same. Voltages are added.

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

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



The circuit can be replaced by a single resistor.

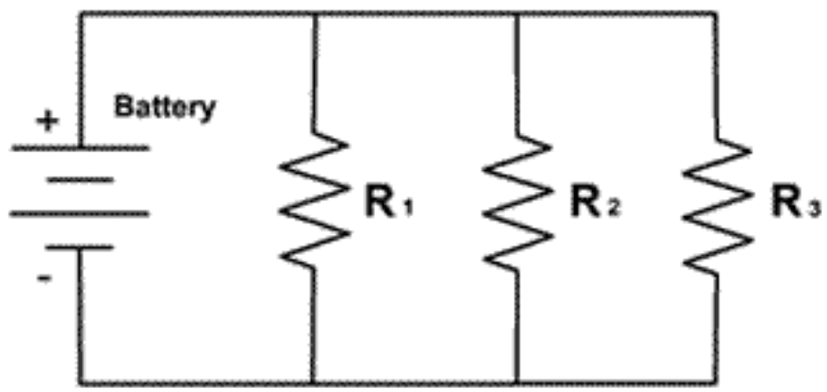
$$R = \frac{V_{total}}{I_{total}} = R_1 + R_2 + R_3$$

Parallel connection

Voltages are the same. Currents are added.

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

$$I_{total} = I_1 + I_2 + I_3$$



The circuit can be replaced by a single resistor.

$$\frac{1}{R} = \frac{V_{total}}{I_{total}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

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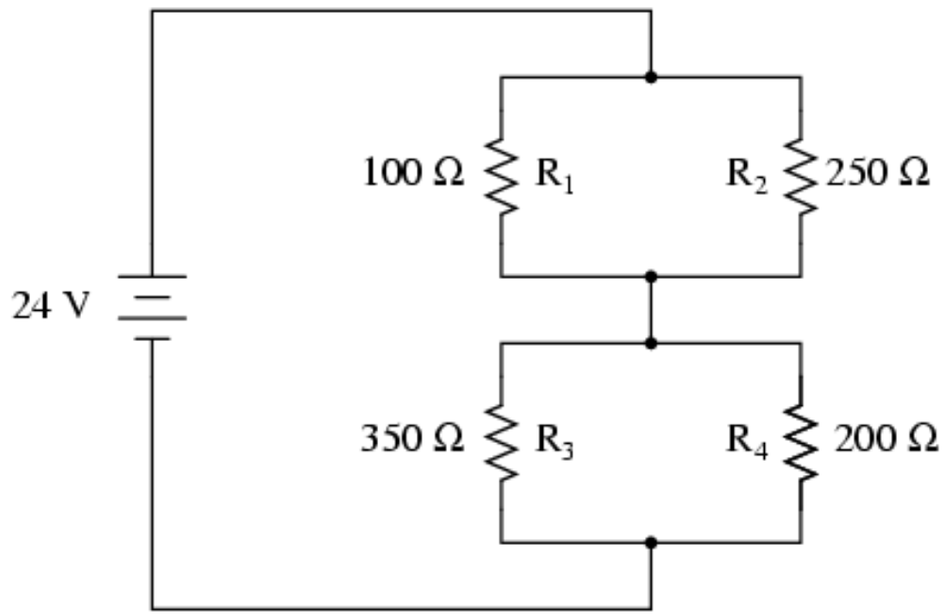
Physics 0

Homework

Problem 1

Find the overall resistance R for the resistor circuit shown in the Figure. Find the current running through the battery.

A series-parallel combination circuit



Problem 2

The resistor circuit shown in the Figure is called the bridge resistor circuit. It is neither parallel, not series connection of resistors. Finding its equivalent resistance in general is more complicated than for a combination of parallel and series connections. Try to do it for particular values of resistances
$R_3 = 200\ \Omega$, $R_1 = R_2 = R_4 = R_5 = 100\ \Omega$

What is the current running through battery for $E_1 = 24\ V$?