PHYSICS 12

OHM'S LAW

$$R = \frac{V}{I} \qquad \text{or} \qquad V = IR \qquad \text{or} \qquad I = \frac{V}{R}$$

where R is resistance measured in Ohms [Ω]
V is voltage measured in Volts [V]
and I is electric current measured in Amperes [A]

RESISTANCE

$$R = \rho \frac{L}{A}$$

where $\rho$is resistivity of the material measured in Ohm meter [Ω · m]
A is the cross-sectional area of the conductor measured in meter squared [m^2]
and L is the length of the conductor measured in meters [m]

ELECTRIC POWER

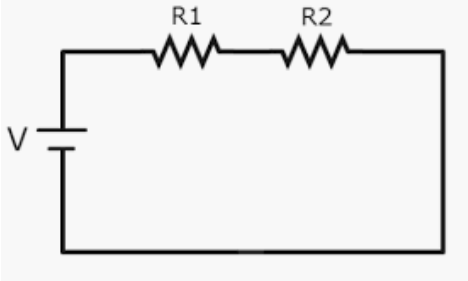
$$P = IV = I^2R$$

where P is power measured in Watts [W]
I is electric current measured in Amperes [A]
V is voltage measured in Volts [V]
and R is resistance measured in Ohms [Ω]

RESISTORS CONNECTED IN SERIES

- Equivalent (total) resistance in a circuit with resistors in series is the sum of all individual resistances.
- Same current goes through every resistor.

$$R_{eq} = R_1 + R_2 + R_3 + \cdots + R_n$$



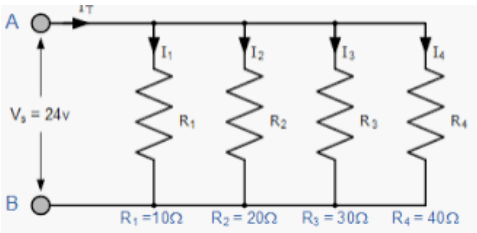
RESISTORS CONNECTED IN PARALLEL

- Equivalent (total) resistance in a circuit with resistors in parallel is calculated by finding the sum of reciprocal values of all resistors followed by reciprocating that sum.

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \cdots + \frac{1}{R_n}$$

$$R_{eq} = \frac{1}{\frac{1}{R_{eq}}}$$

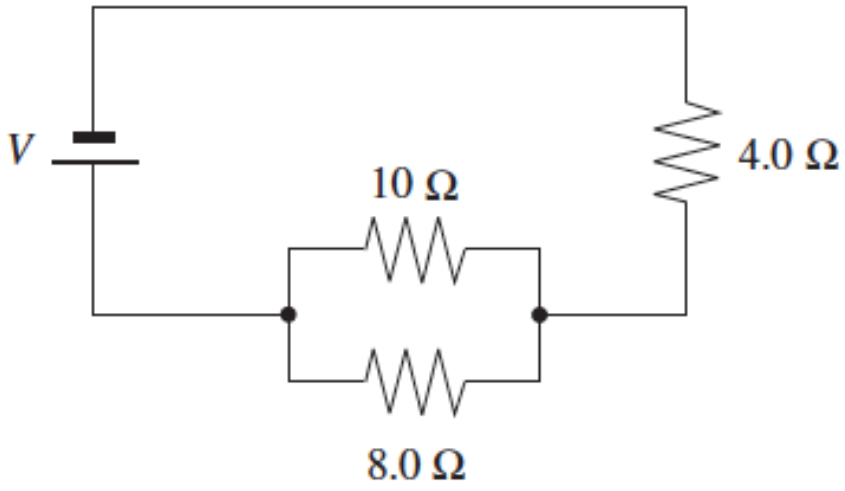
- Same voltage is applied across each resistor.



RESISTORS CONNECTED IN SERIES AND IN PARALLEL

- Most circuits have resistors wired in series as well as in parallel

Example : Find the equivalent resistance in the circuit below. If the battery provides 12.0 V of voltage, what is the current through the 10Ω resistor?



KIRCHHOFF'S RULES

1. Junction rule: The sum of the magnitudes of the currents directed into a junction equals the sum of magnitudes of the currents directed out of the junction.

2. Loop rule: Around any closed-circuit loop, the sum of potential drops equals the sum of potential rises.

Example: Find the equivalent resistance in the circuit given that the current through the 8.0 Ω is 1.25 A.