

Physics "Resistors" Summary

Tuesday, January 3, 2023 6:50 PM

1. Resistors:

A resistor is an electrical element that converts electrical energy into heat energy.

2. Resistance:

Measures the opposition to the flow of charges that constitute the electrical current.

★ The S.I unit of the resistance is: Ohm (Ω)

★ Whenever the resistance increases \longrightarrow The current decreases (**and vice versa**)

★ Resistance of a resistor is measured by the **Ohmmeter**.

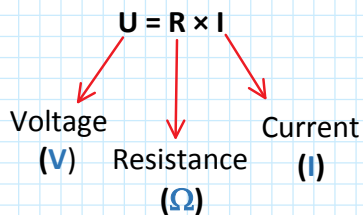
Note:

\rightarrow kilo-Ohm ($k\Omega$) $\xrightarrow{\times 10^3}$ Ohm (Ω)

\rightarrow Mega-Ohm ($M\Omega$) $\xrightarrow{\times 10^6}$ Ohm (Ω)

\rightarrow Milli-Ohm ($m\Omega$) $\xrightarrow{\times 10^{-3}}$ Ohm (Ω)

3. Ohms Law:



4. Equation of a straight line:

$$Y = ac$$



As slope \nearrow st. line deviates towards Y-axis

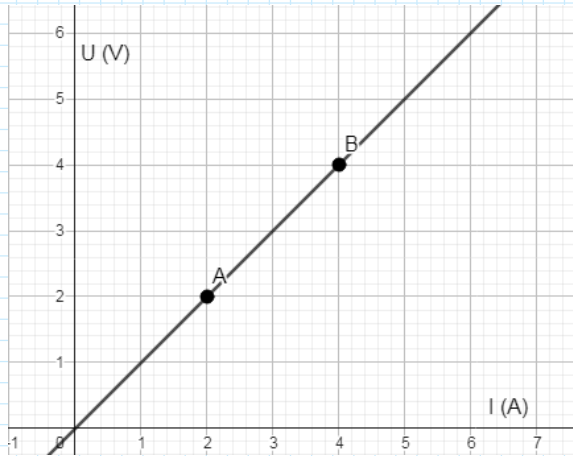
$$Y=ac$$

As slope ↗ st. line deviates towards Y-axis
 $Y=\alpha\chi$: equation of straight line passing through the origin (0)

$$\text{Slope} = \frac{yb-ya}{xb-xa}$$

$$y=ax$$

 ↓ Slope



5. Resistors grouped in series

$$R_{\text{equivalent}} = R_1 + R_2 + R_3 \dots$$

★ $R_{\text{equivalent}}$ is greater than the greatest resistor

6. Resistors grouped in parallel:

1st method:

$$\frac{1}{R_{\text{equivalent}}} = \frac{1}{R_1} + \frac{1}{R_2}$$

2nd method:

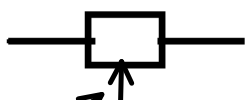
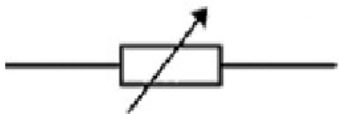
$$R_{\text{equivalent}} = \frac{R_1 \times R_2}{R_1 + R_2}$$

★ $R_{\text{equivalent}}$ is smaller than the smallest resistor

★ Only valid if you have 2 resistors in parallel

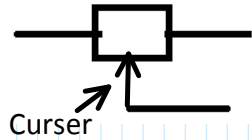
7. Rheostat:

Is a resistor of adjustable (variable) resistance.



$$R_h = (0, 100)$$

 ↑ R_{max}



8. $P = U \times I$

Where: P: power in watts
 U: Voltage in volts
 I: current in amperes

$$P_{dry\ cell} = P_1 + P_2 + P_3 \dots$$

9. $P = U \times I$
 $= (R \times I) \times I$
 $= R \times I^2$

★ 1 kilo-watt (Kw) $\xrightarrow{\times 10^3}$ watt (w)

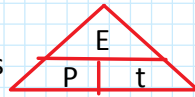
★ 1 Mega-watt (Mw) $\xrightarrow{\times 10^6}$ watt (w)

★ 1 milli-watt (mw) $\xrightarrow{\times 10^{-3}}$ watt (w)

10. $P = U \times I$
 $= U \times \frac{U}{R}$
 $= \frac{U^2}{R}$

11. $E = P \times t$

Where: E: energy in joules
 P: power in watts
 t: time in seconds.



★ $E(J) = P(w) \times t(sec)$

★ $E(Kw-hr) = P(w) \times t(hr)$

★ $E(w-hr) = P(w) \times t(hr)$

REMARK!!!!

In your house, car... loads are connected in parallel



they can function normally
 they receive equal voltage

12. **Circuit breaker (Fuse) :**

Used to protect devices from overload (excessive) current.