

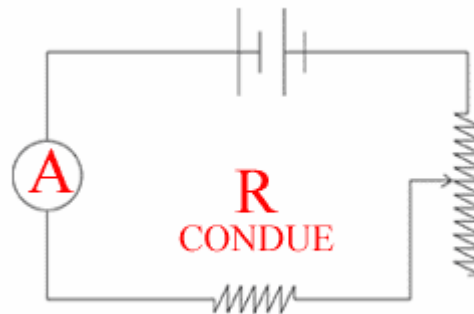
Ohm's Law

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(Relation between p.d & I in a conductor at constant temp.)

EXPERIM :

- 1- the connect circuit as shown
- 2- switch on the key and measure (the reading of the ammeter & V_1).
(The reading of the voltmeter).
- 3- Vary the intensity of current passing by means of the rheostat to I_2 & measure V_2 , and so on,
- 4- Tabulate the results and plot a graph.



CONCLUSIONS :

1- Ohm's law:

“p.d between two terminals of a conductor is direct. prop. to the intensity of current Passed through it, at constant temp.”

Volt	Amp
V	I
10	2
20	4
30	6

2- \ $V \propto I$ \ $V = I \times \text{constan } t(\text{called Resistance})$

$$\begin{array}{ccccc} V & = & I & \times & R \\ \text{volt} & & \text{amp} & & \text{ohm} \end{array}$$

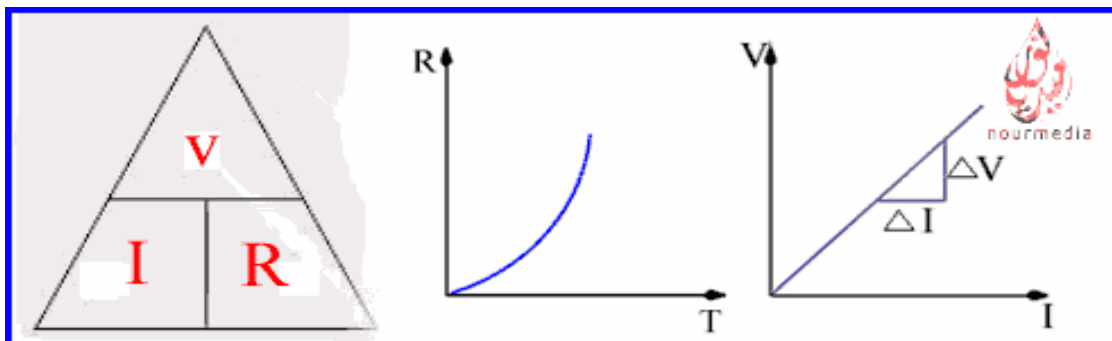
3- define of the resistance of a conductor “R”:

“it is the ratio between the “p.d” & “I” passing through it, at constant temp.

4- Unit of Resistance (the ohm Ω)

“It is the resistance of a conductor when p.d of one volt across its ends and allows the passage of current of one ampere

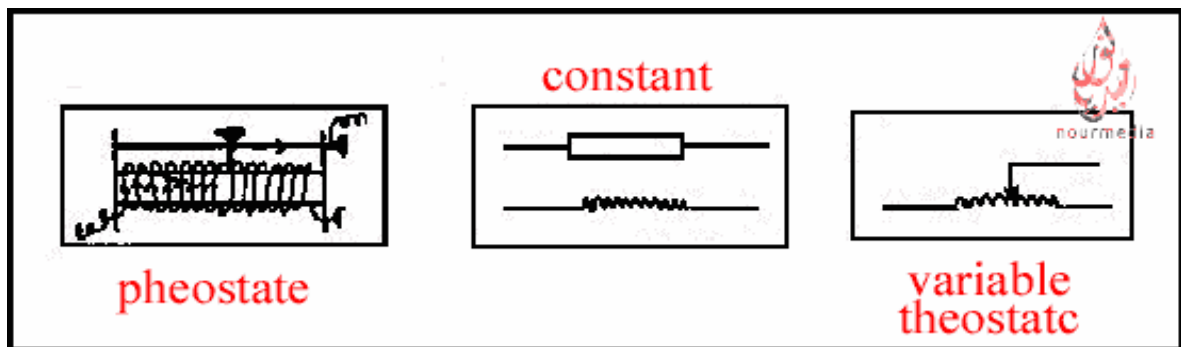
5- Graph V & I :



6- Meaning of resistance :

When the current, electrons pass through the conductor they collide with the electrons of its atoms, thus the conductor does work, needed to overcome the passage of the electrons. This work (consider as resistance) appears in another form as heat , and is supplied from the source.

7- Symbol of resistance:



8- The standard ohm:

9- Function of R:

- (1) To control I .
- (2) To cause drop in voltage across the conductor.

10- Relations of ohm's law:

$$\begin{array}{lll}
 V \propto I & V \propto I & I \propto \frac{1}{R} \\
 \text{at constant } R & \text{at constant } I & \text{at constant } V
 \end{array}$$

11- How can you determine “R” of a conductor by ohm’s law circuit?

12- Factors affecting the electric resistance:

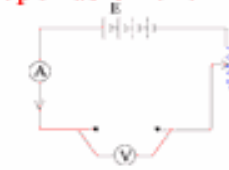
Length (L)
 $R \propto L$

$$\frac{R_1}{R_2} = \frac{L_1}{L_2}$$

C.S area (A)
 $R \propto \frac{1}{A}$

$$\frac{R_1}{R_2} = \frac{A_2}{A_1}$$

kind of material R depends on the kind



How can you verify the previous factors in lab ?

Fe L1

Fe L1

$\therefore R \propto \frac{L}{A}$

$R = \frac{\rho L^{(m)}}{A (m^2)}$

Fe A1


Fe A2

$\therefore R = \frac{L}{A} \times \text{constant is called Resistivity } \rho$

$A = \pi r^2$

Fe

Cu



13- define. of Resistivity r :

“It is the resistance of a conductor of one meter in length and 1 m^2 in C.S. area at certain temp.”

14- Resistivity depends on ⁽¹⁾ the material. This means that the resistivity is a characteristic property. ⁽²⁾ Temperature, Its unit = ohm. M ⁽³⁾ purity.

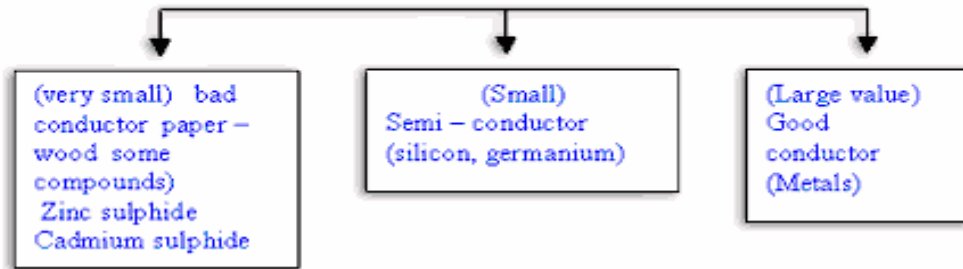
15- Conductivity of a material S (Sigma) :

• “It is the reciprocal of the resistivity,”

• its unit is $\text{ohm}^{-1} \cdot \text{m}^{-1}$ (simon.m⁻¹)

$$S = \frac{1}{r}$$

If conductivity σ "



16- How can you determine r & S of a conductor:

1- Measure the length L of the conductor and C.S. area $= A = \pi r^2$

2- Join it in ohm's law circuit and measure I & V , then R then $R = \frac{V}{I}$

$$r = \frac{RA}{L}$$

$$S = \frac{1}{r}$$

Note: Draw the circuit of test gap.

17- If a conductor is melted and reshaped in another one with double length, find its new R .



$$A_1 = A_2 \times \frac{1}{2}$$

$$\frac{R_1}{R_2} = \frac{\rho L_1}{A_1} \times \frac{A_2}{\rho L_2}$$

$$\frac{R_1}{R_2} = \frac{L_1}{A_1} \times \frac{1/2 A_1}{2 L_1} = \frac{1}{4}$$

The new resistance becomes four times the first

