
Experiment No.2

Ohm's Law

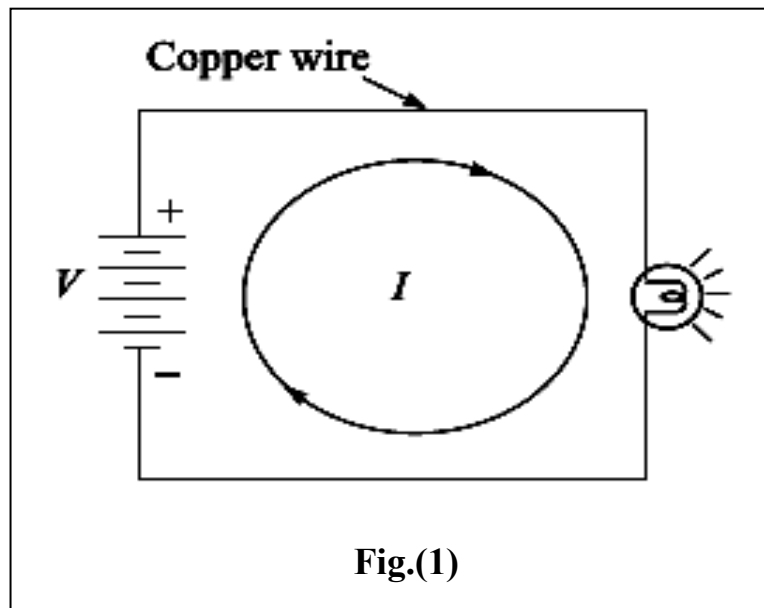
Aim of experiment: To investigate the Ohm's Law

Apparatus

1. DC circuit training system
2. Set of wires.
3. DC Power supply
4. Digital A.V.O. meter.

Theory

In Fig.(1), the tungsten filament of the light bulb offers a considerable amount of opposition, or what is called **ELECTRICAL RESISTANCE**, to the passage of electric current through it. Because of the high resistance of the filament, the battery voltage V must be relatively high in order to produce the amount of current I required to heat the filament to incandescence.



R denotes the amount of electrical resistance, and in electrical diagrams, the presence of resistance is represented by the symbol. Using this symbol, we have

redrawn Fig.(1) as Fig.(2), in which R denotes the “electrical resistance” of the tungsten filament in the light bulb.

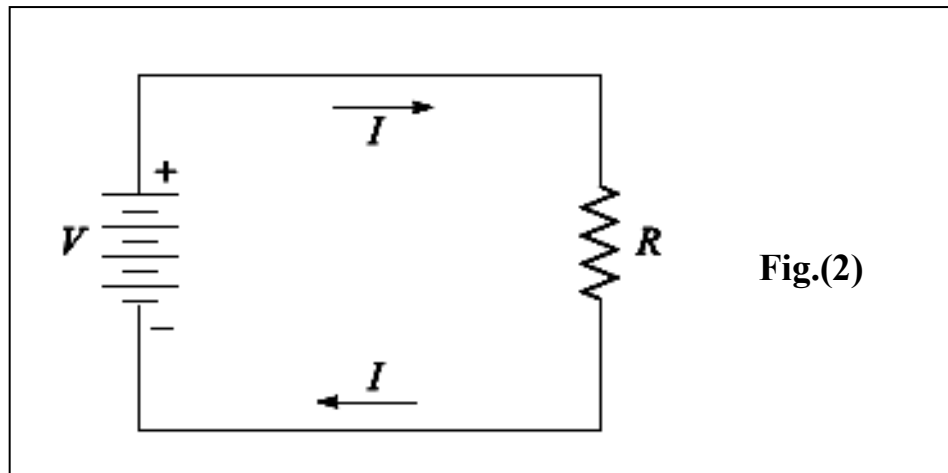


Fig.(2)

We have already learned that substances that offer little resistance to the passage of current are called “conductors,” while those that offer great resistance are called “insulators.”

The first comprehensive investigation into the nature and measurement of electrical resistance was made by the *German physicist Ohm* (as in “home”) around the year 1826. After a lengthy series of experiments, Ohm was able to report that,

"The current in a conductor is directly proportional to the potential difference between the terminals of the conductor and inversely proportional to the resistance of the conductor"

The above constitutes is called **OHM’S LAW**. If we let
 V = potential difference (emf) applied to the conductor,
 I = current in the conductor,
 R = resistance of the conductor,

Therefore, if we express **V** in volts, **I** in amperes, and **R** in ohms, then the basic OHM'S LAW is:

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

The relationship between V & I can be represented in Fig.(3).

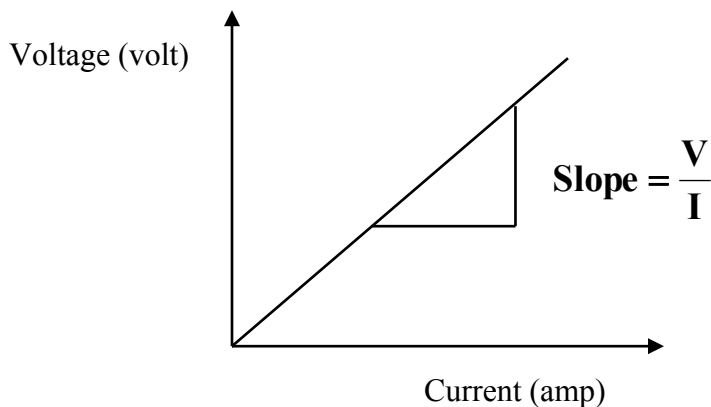


Fig.(3)

There are, of course, many grades of conductors (and insulators). Take, for example, two metals such as copper and tungsten. Both are classified as “conductors,” but a copper wire is a better conductor than a tungsten wire of the same length and diameter;

Conductor: A material, which gives up free electron early and offers little opposition to current flow and the unit of conductance, is (siemens).

The inverse of resistance called conductance (G) where

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

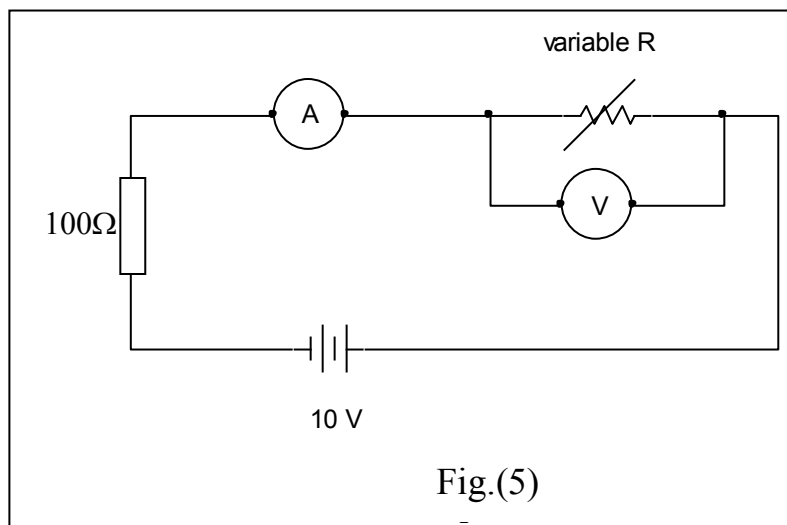
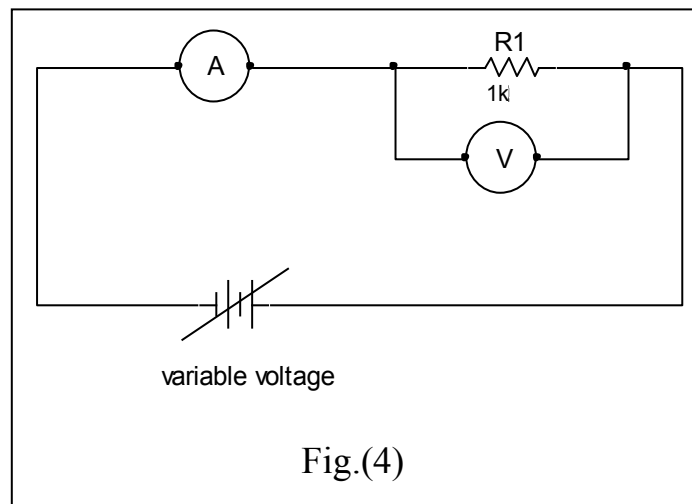
Procedure

1. Using the DC circuit trainer, connect the circuit shown in Fig. (4). Increase the voltage from 0-10v and measure current in each step, and then record it in table below.

V(volt)	0	1	2	3	4	5	6	7	8	9	10
I(mA)											

2. Repeat step (1) with exchange the R_1 by the light bulb
3. Connect the circuit shown in Fig.(5). Change the resistor value from 50-500 Ω , measure current, and voltage in each step, and then record it in table below.

$R(\Omega)$	50	100	150	200	250	300	350	400	450	500
$I(\text{mA})$										
$V(\text{volt})$										



Discussion

1. Draw the relationship between V & I from table in step 1, and the relationship between R & I for table in step 2.
2. Is it necessary that the relationship between V & I start with the original point (0, 0) and why?
3. For the table in step 2, find G in each step.
4. What does the slopes represent in V & I relationship?
5. Why should the graphic be a straight line in step (1)?