(DC1-1) Measurement of Ohmic Resistances Using Ammeter and Voltmeter

Aim of experiment

1. Verification of Ohm's law
2. Verification of the law of series and parallel resistances connection.

Tools

Voltmeter-Ammeter-Power Supply - Resistors R_1 and R_2.

Theory of experiment

OHM'S law states that when two points are taken on linear conductor, the ratio of the difference of potential, V, between those points to the current, I, flowing through the conductor is a constant. This constant ratio is termed the resistance, R, of the conductor. The reciprocal of R is the conductance.

A resistor is a piece of apparatus used on account of its possessing resistance. The most direct method of measuring resistance is to measure the potential difference, and the current. If a voltmeter measures the difference of potential in volts and the strength of the current in amperes, is measured by an ammeter, the resistance is in ohms.

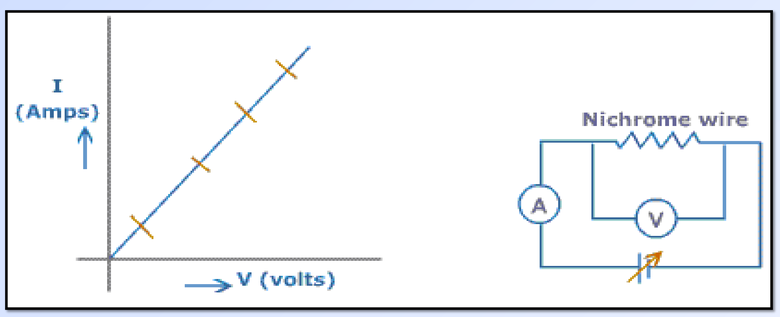

Figure 1. The I-V characteristic of an Ohmic resistance and the circuit diagram

Note carefully that the ammeter is con-nected in series with the resistance to be measured, while the voltmeter is connected across the ends of the resistance, so that, with a moving-coil instrument, the coil of the voltmeter is in parallel with the resistance.

The terminals marked + on the ammeter and the voltmeter must be connected to the + pole of the battery, or the power supply. In this method the resistance of the conductor is measured while a current is flowing through it. The method is therefore applicable in cases where other methods fail; for instance, we can measure in this way the resistance of an incandescent electric lamp while it is glowing. This is a rough method only, though very convenient in many cases. It depends on the observed deflections of the ammeter and voltmeter, and is thus not as accurate as a null method of measuring resistance. If the ammeter and voltmeter have not been calibrated, the result may be erroneous owing to errors of graduation.

Procedures

Experiment 1: Measurement of a resistance using ammeter and voltmeter

1. Connect the circuit as shown in *figure 1.*
2. Using the rheostat, built in the power supply, adjust the voltage across the resistance, R_1, to be 0.5 V and take the ammeter reading.
3. Increase the voltage at steps of 0.5V and notice the ammeter reading I.
4. Repeat step 3 at least three times and tabulate your results.
5. Plot the relation between V and I_{av} and determine the slope from which calculate the resistance R_1.
6. Repeat the above steps for resistance R_2.

Results

R1					R2				
V (V)	I_1 (A)	I_2 (A)	I_3 (A)	I_{av} (A)	V (V)	I_1 (A)	I_2 (A)	I_3 (A)	I_{av} (A)

Edusoft
Innovate to educate

(DC1-1) Measurement of Ohmic Resistances Using Ammeter and Voltmeter

Experiment 2: Verification of the law of the parallel and series resistance connections for R_1 and R_2.

1- Repeat the above steps for R_1 and R_2 are connected in series and measure R_s.
2- Repeat the above steps for R_1 and R_2 are connected in parallel and measure R_p.
3- Verify the series and parallel connection laws.

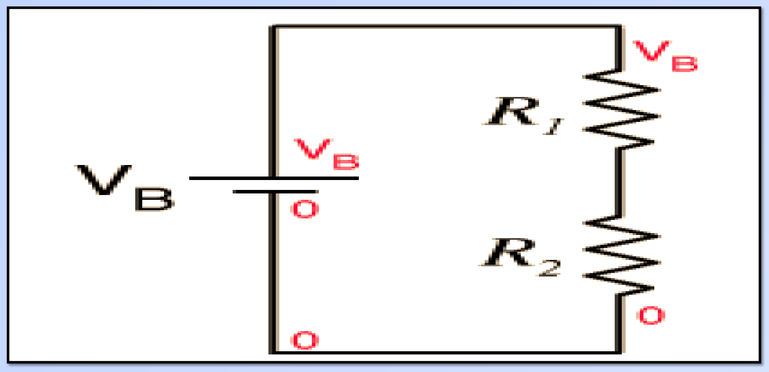

Figure 3. A circuit of series connection

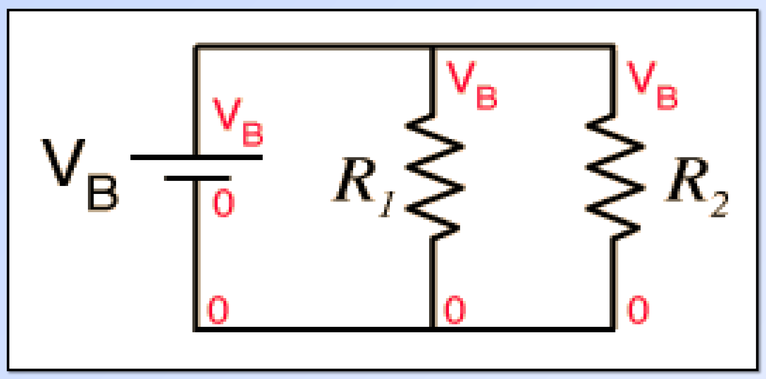

Figure 4.A circuit of parallel connection

Procedures

1- Repeat the above steps for R_1 and R_2 are connected in series and measure I and V and calculate R_s.
2- Repeat the above steps for R_1 and R_2 are connected in parallel and measure I and V and calculate R_p.
3- Verify the series and parallel connection laws.

Results

Series connection		Parallel connection	
V (V)	I (A)	V (V)	I (A)

R_s = R_p=

Compare the measured R_1 and R_2 of experiment 1 with that obtained from R_s and R_p of experiment 2.