AMERICAN INTERNATIONAL UNIVERSITY–BANGLADESH (AIUB)

FACULTY OF SCIENCE & TECHNOLOGY

DEPARTMENT OF PHYSICS

PHYSICS 1 LAB

Spring 2021-2022

Section: B19, Group: 03

LAB REPORT ON

(a) Study of Ohm's law using unknown resistances.

(b) Determination of the equivalent resistances for series and parallel combinations of resistors.

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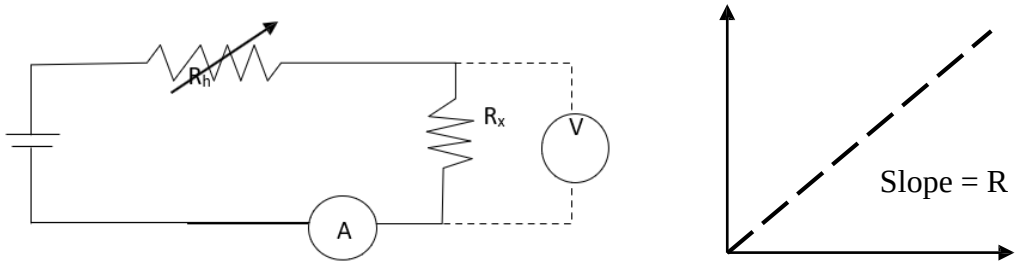
1. Theory

Ohm's law states that the current through a conductor between two points is directly proportional to the voltage across those two points. Introducing the constant of proportionality, the resistance, one arrives at the usual mathematical equation that describes this relationship:

$$V = IR$$

where *I* is the current and V is the potential difference across the resistance R



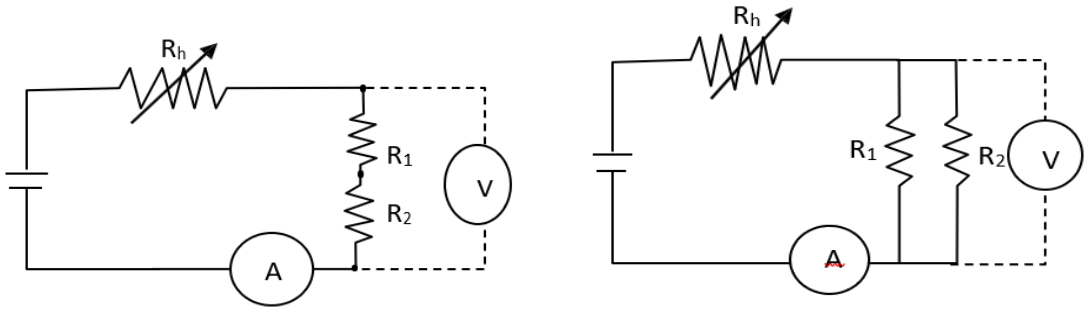
(a) (b)

Figure 5.1: (a) Simple circuit to determine unknown resistance, R_X by using Ohm's law, ammeter (A) and voltmeter (V) are used to measure the current and potential drop in the circuit, variable resistor, R_h is used to change the current flow in the circuit (b) Slope of the V vs I graph gives the value of R.

When *N* number of resistors are connected in series and parallel connections their equivalent resistances R_S and R_P are calculated by the following two equations:

$$R_s = R_1 + R_2 + \cdots\cdots + R_N$$

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots\cdots + \frac{1}{R_N}$$



(a) (b)

Figure 5.2: Series and parallel connections are shown for two resistors R_1 and R_2 in (a) and (b), respectively

2. Apparatus

1.Power Supply

2.Variable resistor

3.Ammeter

4.Voltmeter

5.Unknown resistors

6.Connecting wires

3. Procedure

1.First of all, we constructed above with 2 unknown resistances (R_1 & R_2).

2.By choosing R_h current not more than 1 A, we varied R_h to select 06 different currents through the circuit as measured by the ammeter A.

3.Then we measured the corresponding potential differences (V) in the voltmeter.

4. Experimental Data

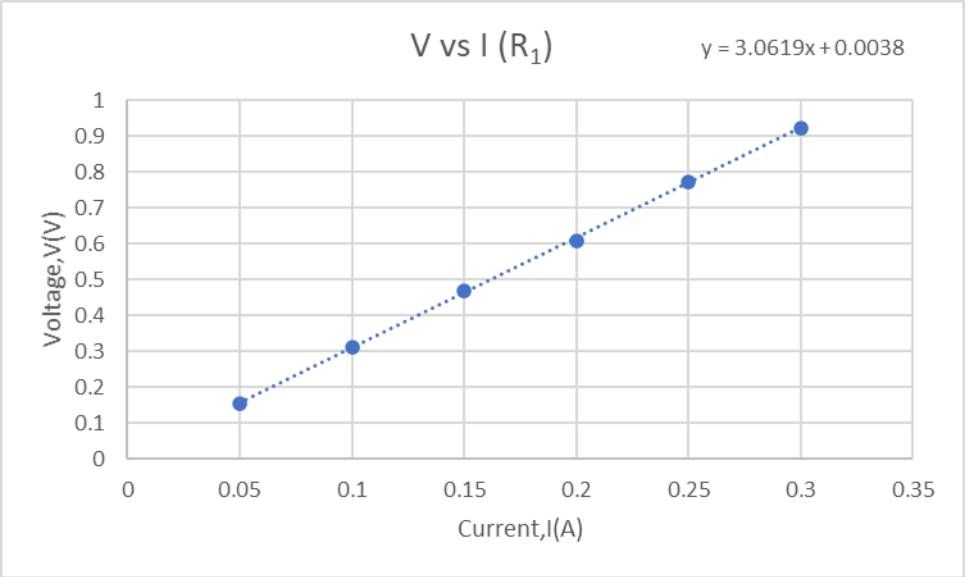
Table 1: Voltage current records for R_1 and R_2

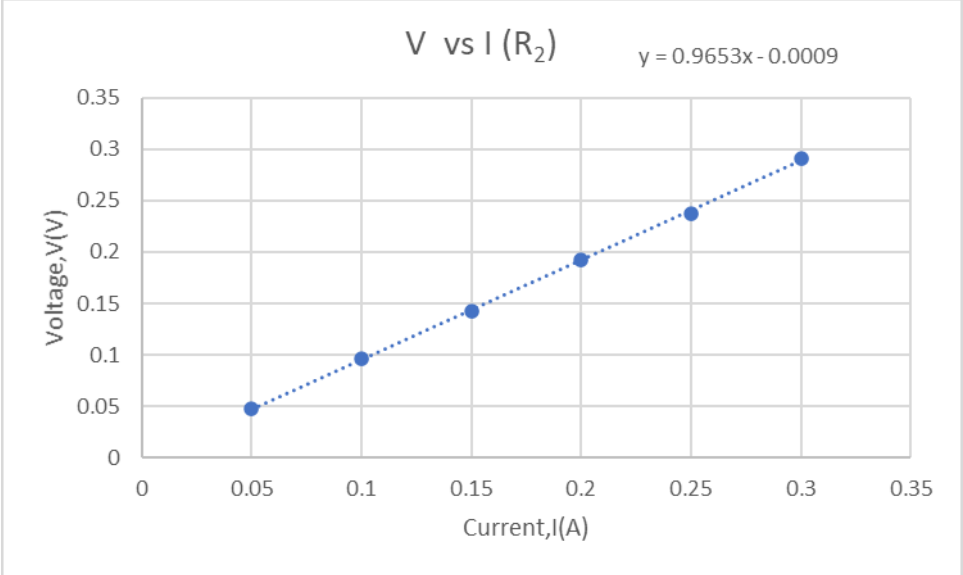
Resistors	Current I (A)	Voltage V (V)
R_1	0.05	0.1546
	0.10	0.3109
	0.15	0.470
	0.20	0.608
	0.25	0.772
	0.30	0.922
R_2	0.05	0.0478
	0.10	0.0967
	0.15	0.1429
	0.20	0.1923
	0.25	0.237
	0.30	0.2916

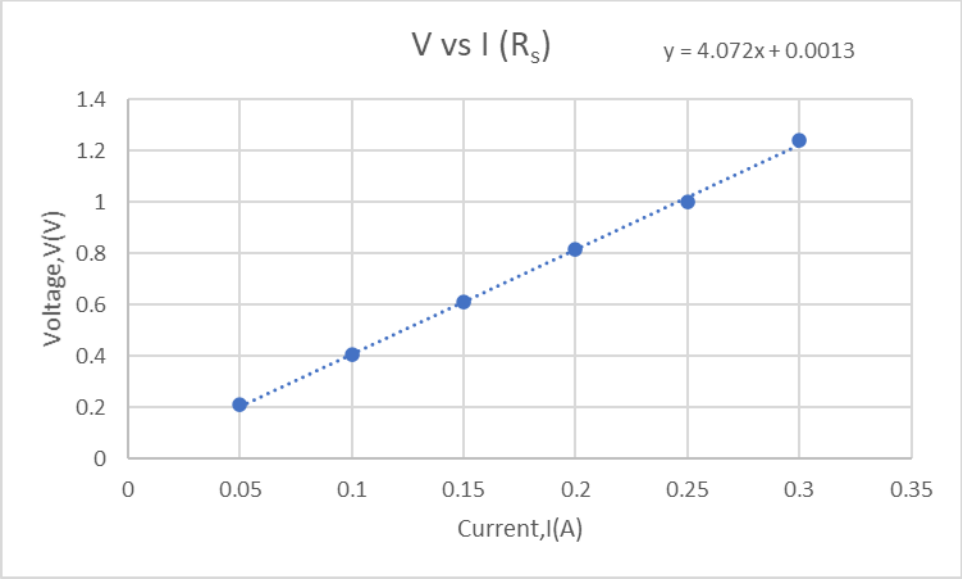
Table 2:Voltage current records for series and parallel connestions

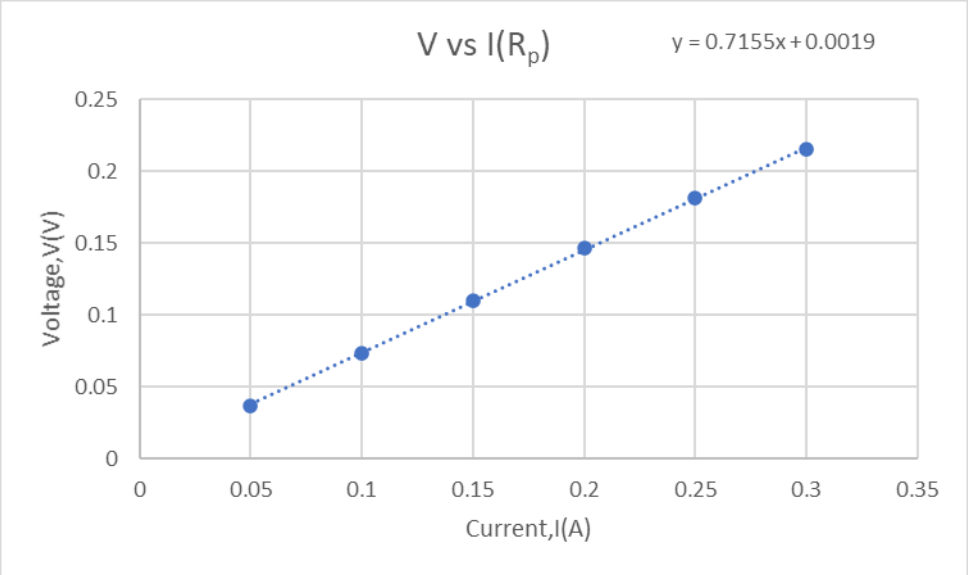
Combination of R_1 & R_2	Current I (A)	Voltage V (v)
Series Combination	0.05	0.2116
	0.10	0.404
	0.15	0.613
	0.20	0.817
	0.25	0.999
	0.30	1.239
Parallel Combination	0.05	0.0365
	0.10	0.0733
	0.15	0.11
	0.20	0.1467
	0.25	0.1813
	0.30	0.2148

5. Analysis and Calculation






V vs I (R_s)
y = 4.072x + 0.0013
Voltage,V(V)
Current,I(A)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
0.05
0.1
0.15
0.2
0.25
0.3
0.35


V vs I(R_p)
y = 0.7155x + 0.0019
Voltage,V(V)
Current,I(A)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35

Calculating the values of R_s and R_p:

$R_s = R_1 + R_2 = (3.0619 + 0.9653)\ \Omega$

$R_s = 4.0272\ \Omega$

$\frac{1}{Rp} = \frac{1}{R1} + \frac{1}{R2} = \left(\frac{1}{3.0619} + \frac{1}{0.9653}\right) = 1.3625\ \Omega$

$R_p = \frac{1}{1.3625} = 0.7339\ \Omega$

6. Result

Resistances from the graphs		Calculated Values fo R_s and R_p in ohms	Comments
Resistors	Values in Ohms		We got R_s = 4.072 Ω and R_p = 0.7155 Ω from the experiment. Hand calculated values ,R_s = 4.072 Ω and R_p = 0.7399 Ω .So we can say that the experiment is varified
R_1	3.0619		
R_1	0.9653		
R_s	4.072	4.0272	
R_p	0.7155	0.7339	

7. Discussion

1.We got our values of R_s and R_p very close. But if you have taken more reading then our values would have more accurate.

2.We were careful about making the graphs.

3. If there is a constant resistance in the circuit, the current is directly proportional to the voltage and will increase as the voltage increases.

4.We took every reading carefully as well as every calculation.

8. References

Fundamental of Physics (10th Edition): Ohm's Law (Chapter 26, page 756-759)