

Experimental No. 3

Ohm's Law

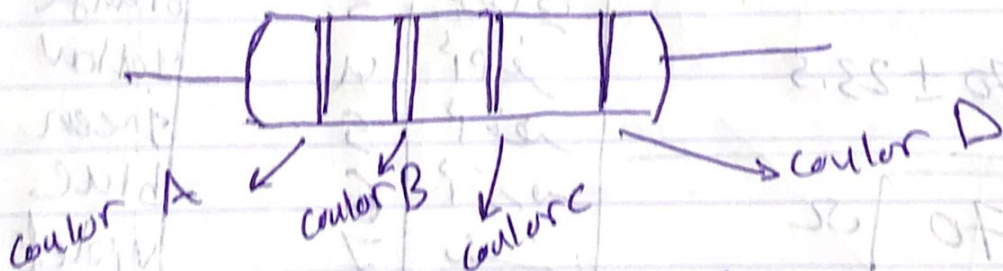
Objectives ① To study the relation between current (I) and voltage (V) across a carbonic resistance (Ohm's Law)

② To find Experimentally the equivalent resistance of two resistors connected in series and parallel

③ to calculate resistance using colors

Theory

① Calculating the value of a carbonic resistance using colors



$$R = AB \times 10^C \pm D$$

D the error gold 5%
silver 10%

Example

- Let
 A: yellow
 B: violet
 C: brown
 D: gold



$$R = AB \times 10^C \pm D$$

$$R = 47 \times 10^1 \pm 5\%$$

$$= 470 \pm 5\%$$

$$\frac{5}{100} \times 470 = 23.5$$

$$R = 470 \pm 23.5$$

$$R = 470 \Omega$$

error

Value of each color	Number	Color
0	black	black
1	brown	brown
2	red	red
3	orange	orange
4	yellow	yellow
5	green	green
6	blue	blue
7	violet	violet
8	grey	grey
9	white	white
$\pm 5\%$	gold	gold
$\pm 10\%$	silver	silver

EX

red red red gold

a b $\times 10^5$ $\pm 1R$

2 2 $\times 10^2$ $\pm 5\%$

$R = 2200 \Omega \pm 5\%$

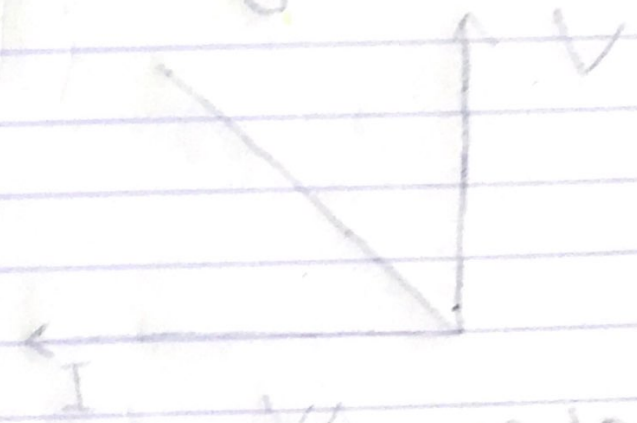
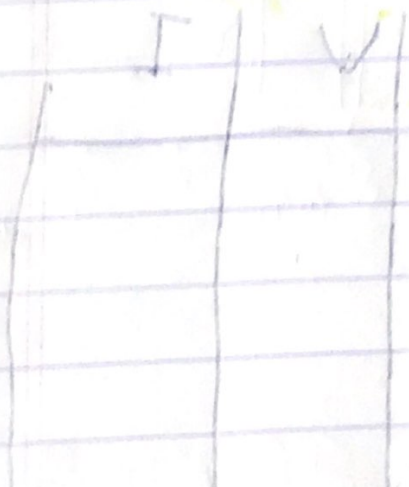
EX

brown black/red gold

a b c d

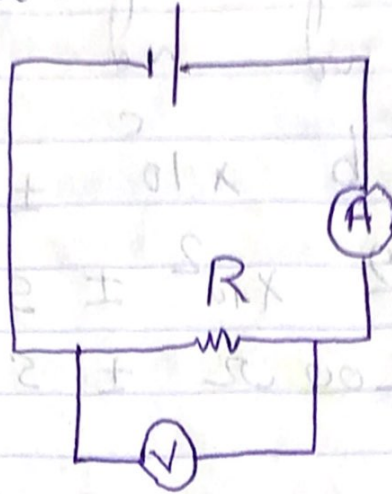
$R = 10 \times 10^2 \pm 5\%$

$= 1000 \Omega \pm 5\%$



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

ohm's Law



for one value

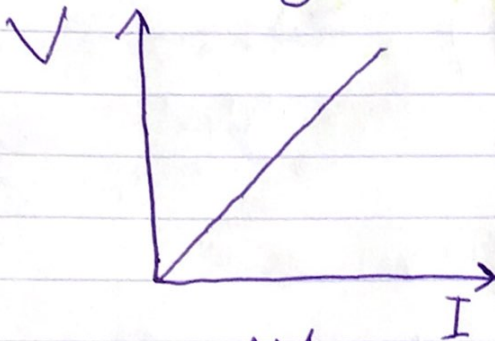
$$V = IR$$

V: voltage (volt) \checkmark

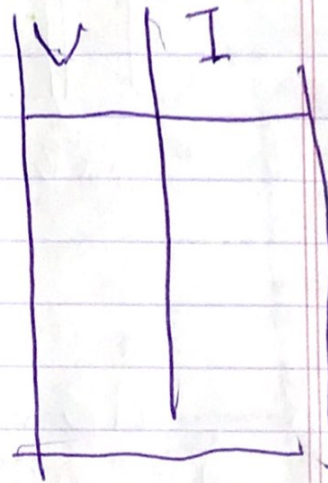
I: current (Ampere) A

R: Resistance (Ω)

for many values (table)



$$\text{slope} = \frac{\Delta V}{\Delta I} = R$$



connecting two resistors in series

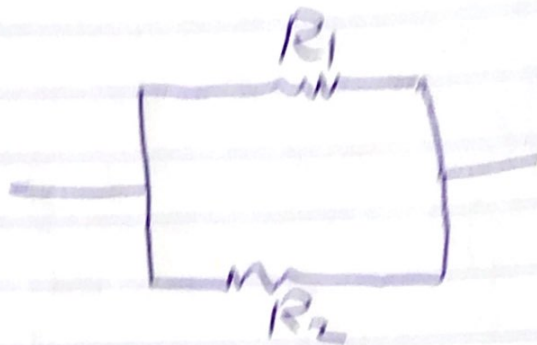
$$R_{eq} = R_1 + R_2$$



connecting two resistors in parallel

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$R_{eq} = \frac{R_1 R_2}{R_1 + R_2}$$



Ex $R_1 = 3\Omega, R_2 = 6\Omega$

1) series

$$R_{eq} = R_1 + R_2 \\ = 3 + 6 = 9\Omega$$

2) parallel

$$R_{eq} = \frac{R_1 R_2}{R_1 + R_2} \\ = \frac{3 \times 6}{3 + 6} = 2\Omega$$

Name:
Students No.:

Grade:
Date:

Data and Calculation

R_1 colors are:

R_2 colors are:

Table 6:

$R_1 =$		$R_2 =$		$R_s =$		$R_p =$	
V	I	V	I	V	I	V	I
Slope =		Slope =		Slope =		Slope =	

Q1: Plot V(Volt) vs I (Amp.) for each resistance and find the slope?

Q2: Find the percentage error in each resistance?

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Q3: Show from your results that $R_s = R_1 + R_2$ and $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$.