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Phys111 Report

Experiment #4: DC Circuit

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Date:			

(1) Abstract:

- **Aim of the experiment:**

To test the material and find out if it is ohmic or non-ohmic, and to find the value of Rs, Rp practically.

- **The main results are:**

$$R = 100 \pm 11\Omega$$

$$R_s = 310 \pm 50\Omega$$

$$R_p = 62 \pm 14\Omega$$

(2) Data:

Part A: One resistor circuit

	1.	2.	3.	4.	5.	6.
$I\ (mA)$	5	10	15	20	25	30
$V\ (volts)$	0.5	1.0	1.5	2.0	2.5	3.0

$\Delta I = 1$ mA	$\Delta V = 0.1$ V

Part B: Two resistors in series

$I_s = 16$ mA	$V_s = 5$ V
$\Delta I_s = 1$mA	$\Delta V_s = 0.5$ V

Part C: Two resistors in parallel

$I_p = 80$ mA	$V_p = 5$ V
$\Delta I_p = 10$ mA	$\Delta V_p = 0.5$ V

(3)Calculations:

Part A: One resistor circuit

From Graph R = Slope $\Delta R \rightarrow \frac{\Delta R}{R} = \frac{\Delta V}{V} + \frac{\Delta I}{I}$	$R = 100\Omega$ $\Delta R = (\frac{0.1}{1.75} + \frac{1}{17.5}) \times 100$ $\Delta R = 11.42857143\Omega \approx 11$	***From Color code***	$R1 = 100\Omega$ $\Delta R1 = 5\Omega$

Resistance form color code:

Brown	Black	Brown	Gold
$R_1 = 100 \pm 5\ \Omega$			

Red	Black	Brown	Gold
$R_2 = 200 \pm 10\,\Omega$			

Part B: Two resistors in series

From Experiment $\frac{\Delta Rs}{Rs} = \frac{\Delta Vs}{Vs} + \frac{\Delta Is}{Is}$	$R_s = \frac{Vs}{Is} = \frac{5}{16\times10^{-3}} = 312.5\Omega$ $\Delta R_s = (\frac{0.5}{5} + \frac{1}{16}) \times 312.5$ $\Delta R_s = 50.78125\Omega \approx 50$	***From Color code*** Rs=R1+R2 ΔR=ΔR1+ΔR2	$R_s = 100 + 200 = 300\Omega$ $\Delta R_s = 5 + 10 = 15\Omega$

Part C: Two resistors in series

From Experiment $\frac{\Delta Rs}{Rs} = \frac{\Delta Vs}{Vs} + \frac{\Delta Is}{Is}$	$R_p = \frac{Vp}{Ip} = \frac{5}{80\times10^{-3}} = 62.5\Omega$ $\Delta R_p = (\frac{0.5}{5} + \frac{10}{80}) \times 62.5$ $\Delta R_p = 14.0625\Omega \approx 14$	***From Color code*** $Rp = \frac{R1\times R2}{R1+R2} = \frac{A}{B}$ $\Delta Rp = \frac{\Delta Rp}{Rp} = \frac{\Delta A}{A} + \frac{\Delta B}{B}$	$R_p = \frac{100\times200}{100+200} = 66.666\Omega \approx 70$ $\Delta R_p = 9.9999\Omega \approx 10$

(4)Results:

$R = 100 \pm 11\ \Omega$
$R_s = 310 \pm 50\ \Omega$
$R_p = 62 \pm 14\ \Omega$

(5)Conclusions:

∴The result for part (A) →

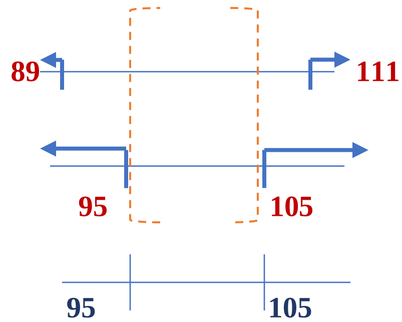
$RTh = 100 \pm 5\ \Omega$

$Rexp = 100 \pm 11\ \Omega$

❁ RANGE TEST:

R exp = [100-11, 100+10] = [89,111] →

R Th = [100-5, 100+5] = [95,105] →



so, the result is <u>accepted.</u>

∴The result for part (B) →

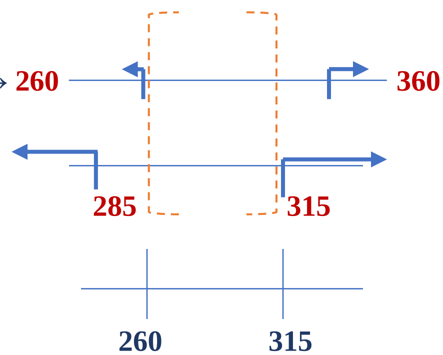
$RTh = 300 \pm 15\ \Omega$

$Rexp = 310 \pm 50\ \Omega$

❁ RANGE TEST:

R exp = [310-50, 310+50] = [260,360] →

R Th = [300-15, 300+15] = [285,315] →



so, the result is <u>accepted.</u>

∴The result for part (C) →

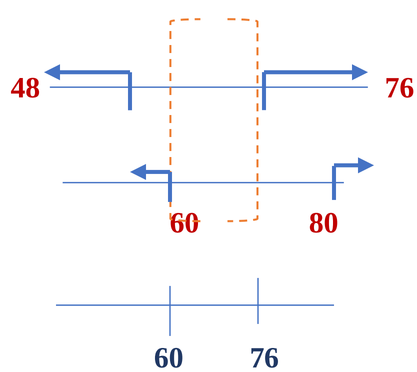
$RTh = 70 \pm 10\ \Omega$

$Rexp = 62 \pm 14\ \Omega$

❁ RANGE TEST:

R exp = [62-14, 62+14] = [48,76] →

R Th = [70-10,70+10] = [60,80] →



so, the result is <u>accepted.</u>

֍The result is accepted in all parts, the value I measured is very close to the true value.

Its due to many possible reasons:

- **The way that the measurements was took is accurate (**note that the measurements has taken from the photos**).**
- **I focused on taking measurements perfectly.**

֍There are many mistakes that I could have made if I had not measured properly.

(Expected errors) :
The actual current through the resistor is less than the measured current. This is because the ammeter has a finite resistance, and therefore draws a small amount of current itself. Also, the temperature of the room: If the ambient temperature deviates significantly from room temperature, the resistance may change significantly. This is because the resistance of most materials is temperature dependent. It is also possible that the wire may be connected in the wrong places, or the reading may be taken in the wrong place or in a wrong way, so the readings are not completely accurate.

֍To reduce the errors, the following steps can be taken: Use an ammeter with a low resistance. Take the reading as quickly as possible to minimize the loading effect. Keeping the ambient temperature constant. Checking the connections and make sure that the reading is taken in the correct place and in the correct way.

V vs I

Two points:

A1(3,3.3)

B1(33,3.3)

Slope(R)=ΔV/ΔI

$$= \frac{(3.3-0.3)}{(33-3)\times10^{-3}}$$

R=100Ω