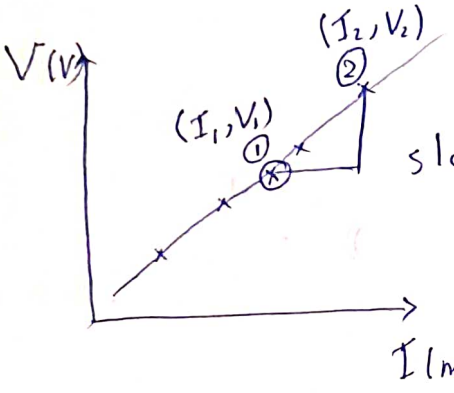
Exp 4: DC circuits

Part A: DC circuit with one resistor.

The aim of this part is finding R_1 (Exp., Theo.)

* $R_{1(exp)}$:

I(mA)				...
V(V)				..



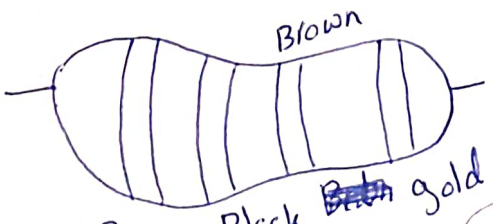
$$slope = \frac{V_2 - V_1}{I_2 - I_1} = R_{1(exp)}$$

$$R = \frac{V}{I} \quad \text{(Ohm's Law)}$$

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

ΔV, ΔI : The uncertainty in V & I from the smallest division on the scale of Voltmeter & Ammeter

$R_{1(Theo)}$: from the color code (page 89)



Carbonic Resistor

$\rightarrow \Delta R_{theo}$

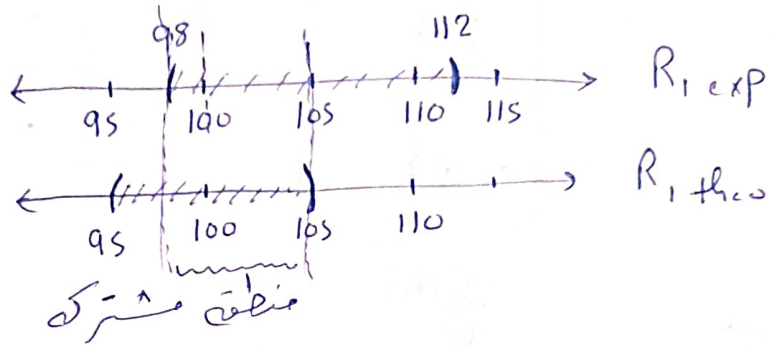
$$R_{1_{theo}} = 100 \mp \frac{5}{100}(100) = 100 \mp 5\ \Omega$$

* To test if R_1 is Accepted or not !!

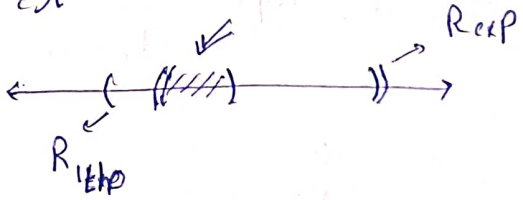
Range test

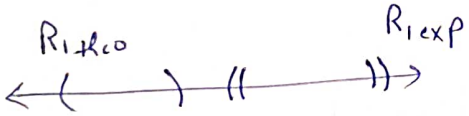
$R_{1exp} = 105 \pm 7\ \Omega \Rightarrow 98 \leq R_{exp} \leq 112$

$R_{1theo} = 100 \pm 5\ \Omega \Rightarrow 95 \leq R_{theo} \leq 105$



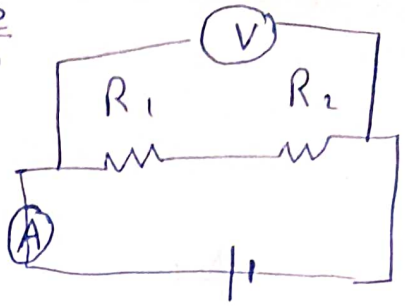
$\Rightarrow$ Accepted



* if 

not accepted

Part B: DC circuit with Two Resistors connected in Series
توالي



* Experimentally:

$$R_{s\,exp} = \frac{V_s}{I_s}$$

$$\frac{\Delta R_{s\,exp}}{R_s} = \frac{\Delta V}{V_s} + \frac{\Delta I}{I_s}$$

ΔV, ΔI : The smallest division on the scale.

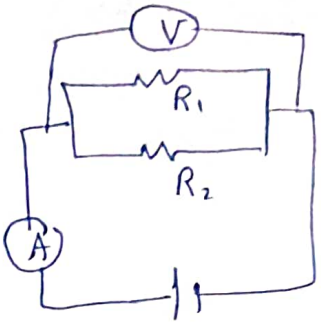
* Theoretically:

$$R_{s\,theo} = R_1 + R_2$$

$$\Delta R_{s\,theo} = \Delta R_1 + \Delta R_2$$

} from the color code

Part C: DC circuit with Two Resistors connected in parallel
على التوازي



* Exp. :

$$R_{P(exp)} = \frac{V_P}{I_P}$$

$$\frac{\Delta R_{P(exp)}}{R_{P(exp)}} = \frac{\Delta V}{V_P} + \frac{\Delta I}{I_P}$$

* Theo :

$$\frac{1}{R_{P(theo)}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$R_{P(theo)} = \frac{R_1 R_2}{R_1 + R_2}$$

} From the Color Code

To find $\Delta R_{P(theo)}$:

$$\frac{\Delta R_{P(theo)}}{|R_{P theo}|^2} = \frac{\Delta R_1}{|-R_1^2|} + \frac{\Delta R_2}{|-R_2^2|}$$

$$\frac{\Delta R_P}{R_{P(theo)}^2} = \frac{\Delta R_1}{R_1^2} + \frac{\Delta R_2}{R_2^2}$$