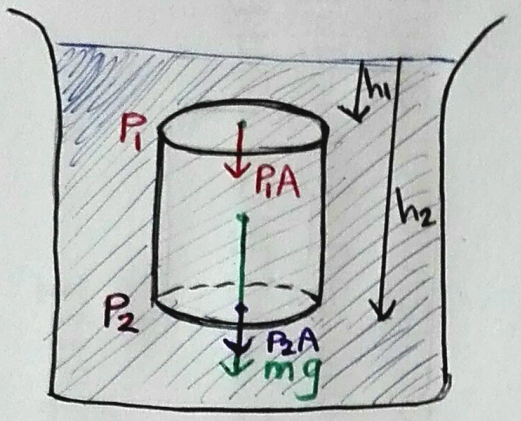
Experiment 3: Density of Liquids

pressure $= \frac{\text{Force}}{\text{Area}} \Rightarrow P = \frac{F}{A}$



$\boxed{P_2 > P_1}$

Static Equilibrium $\Rightarrow \sum \vec{F} = 0$

$$P_2A - P_1A - mg = 0$$

$$(P_2 - P_1)A = mg$$

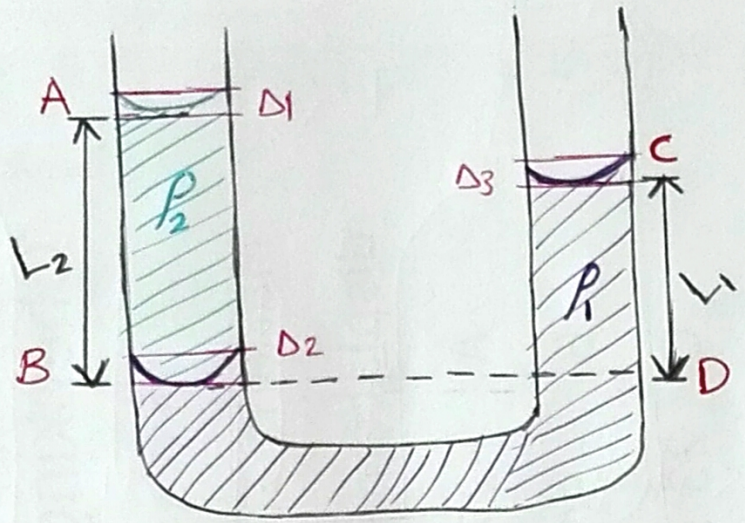
use $\rho = m/V \Rightarrow \left\{\text{Density} = \frac{\text{mass}}{\text{Volume}}\right\}$

$$(P_2 - P_1)A = \rho V g$$

$$(P_2 - P_1)A = \rho A(h_2 - h_1)g$$

$$P_2 - P_1 = \rho(h_2 - h_1)g$$

Experiment 8D



$\rho_1 > \rho_2$

$\rho_1 \equiv$ water

$\rho_{H_2O} = 1\ g/cm^3$

$\rho_2 \equiv$ oil

$$P_B - P_A = \rho_2 L_2 g$$

$$P_D - P_C = \rho_1 L_1 g$$

$P_B = P_D$ "Same vertical height"

$P_A = P_C = P_a$ "$P_a \equiv$ Atmospheric pressure"

$$\rho_2 g L_2 = \rho_1 g L_1$$

$$\rho_2 L_2 = \rho_1 L_1$$

$$\Rightarrow \rho_{oil} L_2 = \rho_{H_2O} L_1$$

$$\rho_{oil} L_2 = (1\ g/cm^3) L_1$$

$$\rho_{oil} L_2 = L_1 \quad \text{"}\rho_{oil} \text{ in } g/cm^3\text{"}$$

Data

L_1 (cm)	1.6	3.3					$\bar{L}_1$
L_2 (cm)	2.0	4.1					$\bar{L}_2$

$\Rightarrow L_1 = \rho L_2$ "renamed ρ_{oil} as ρ"

- A graph of L_1 versus L_2 is a straight line with a slope equal to ρ.

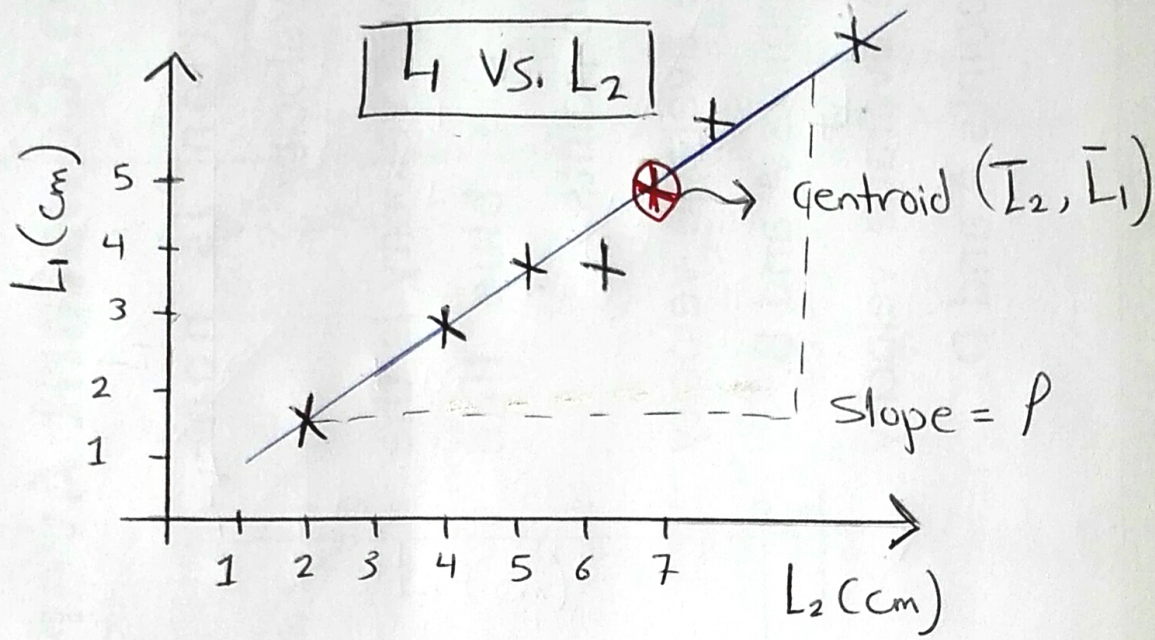
$L_1 = \rho L_2$

L_1: Y-axis, ρ: slope, L_2: X-axis

$y = mx + b$

m = slope

b = intercept



- ρ_{exp} = slope , $\rho_{exp} \pm \Delta\rho$

Note $\rho_{theoretical} = 0.82\ g/cm^3$ "Paraffin oil"

$\rho = \frac{L_1}{L_2}$

$\Delta\rho = \rho_{exp}\left[\frac{\Delta L_1}{\bar{L}_1} + \frac{\Delta L_2}{\bar{L}_2}\right]$

$\Delta L_1 = \Delta_2 + \Delta_3$

$\Delta L_2 = \Delta_1 + \Delta_2$

Note

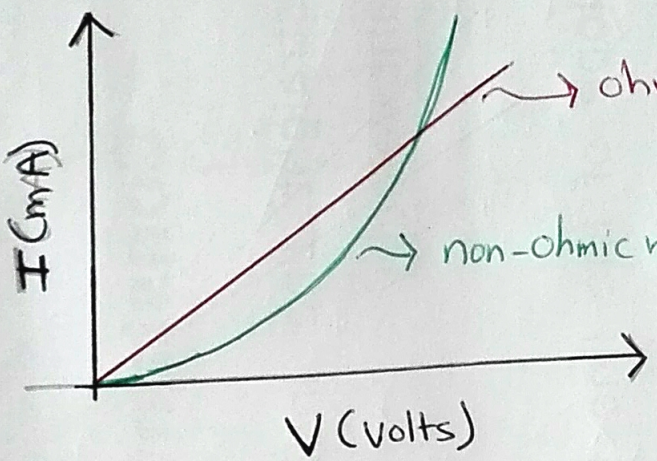
$\Delta_1, \Delta_2, \Delta_3 \Rightarrow$ in Cm

By estimation

Experiment 4: DC Circuits

* Voltage = Current X Resistance

$V = I R$ "Ohm's Law"

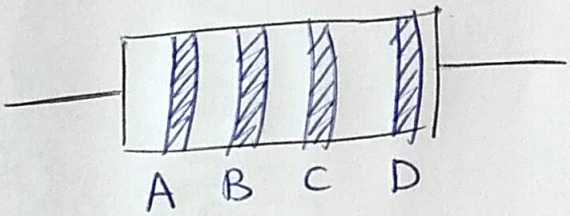


→ ohmic material (Linear)
$R = \frac{1}{\text{Slope}}$ = Constant

→ non-ohmic material (non-Linear)
R is not constant

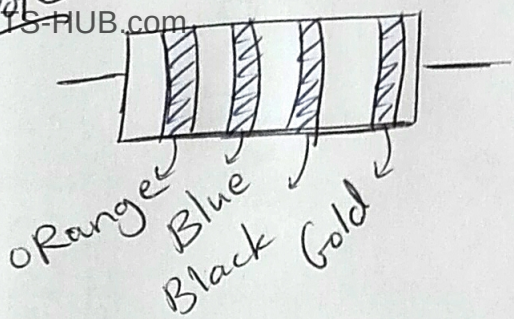
Experiment

part II Carbon Resistance



$R = (AB \times 10^{C} \mp D(AB \times 10^{C}))\ \Omega$

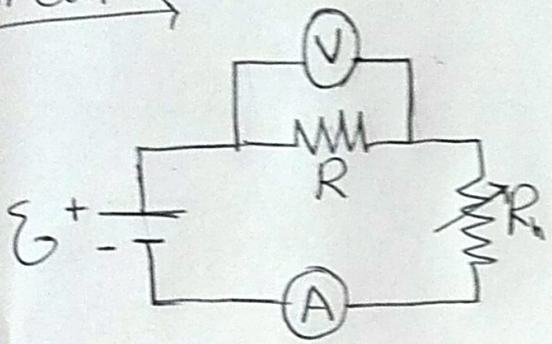
Note



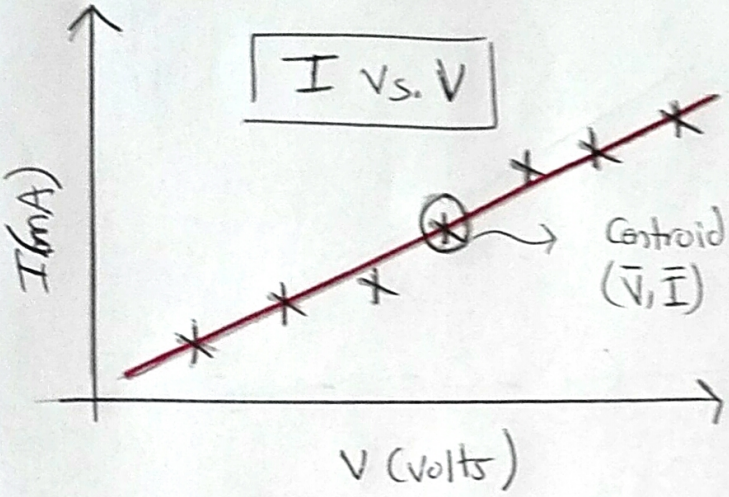
$R = 36 \times 10^{0} \pm (0.05 \times 36)$

$(36.0 \pm 1.8)\ \Omega$

• Circuit →



I (mA)							$\bar{I}$
V (volts)	0.5	1.0	1.5	2.0	2.5	3.0	$\bar{V}$



$$R_{exp} = \frac{1}{\text{slope}}$$

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

$$\Delta R = R_{exp}\left[\frac{\Delta V}{V} + \frac{\Delta I}{I}\right]$$

ΔV, ΔI } By estimation smallest division in device.

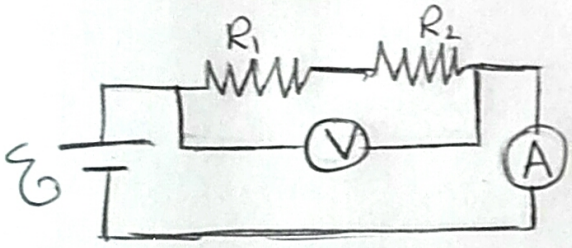
• Range Test →

Note $R_{th} = (36.0 \pm 1.8)\,\Omega \Rightarrow R_{th} = (34.2, 37.8)\,\Omega$

$R_{exp} = (32 \pm 2)\,\Omega \Rightarrow R_{exp} = (30, 34)\,\Omega$

↪ Not accepted "No intersection between the True and experimental intervals"

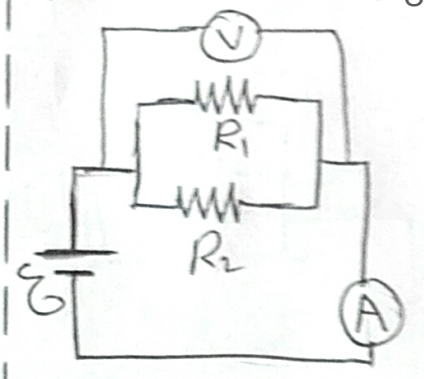
Two Resistors in Series



$$R_s = R_1 + R_2$$

$$R_{s,exp} = \frac{V}{I}$$

Two Resistors in Parallel



$$R_p = \frac{R_1 R_2}{R_1 + R_2}$$

$$R_{p,exp} = \frac{V}{I}$$