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Phys111 Report

Experiment #3: Density of a Liquid

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(1) Abstract:

- **Aim of the experiment:**

We want to know how to find the density of a liquid.

- **The main result is:**
  - The density of the liquid is $\boldsymbol{\rho} =$ **0.79 $\pm$ 0.06 g/cm^3**

(2) Data:

	1.	**2.**	**3.**	**4.**	**5.**	**6.**
$\boldsymbol{L_1}$ $(\boldsymbol{cm})$	2.2 cm	4.1 cm	6.2 cm	7.8 cm	9.2 cm	11.3 cm
$\boldsymbol{L_2}$ $(\boldsymbol{cm})$	2.5 cm	4.9 cm	7.1 cm	9.2 cm	10.8 cm	13.5 cm

$\boldsymbol{\Delta_1} = 0.1$	$\boldsymbol{\Delta_2} = 0.2$	$\boldsymbol{\Delta_3} = 0.1$

(3) Calculations:

$\bar{L}_1 =$ 6.8 cm	$\Delta\bar{L}_1 =$ $\boldsymbol{\Delta_2 + \Delta_3}$ = 0.2 + 0.1 = 0.3
$\bar{L}_2 =$ 8.0 cm	$\Delta\bar{L}_2 = \boldsymbol{\Delta_1 + \Delta_2}$ = 0.1 + 0.2 = 0.3

$\boldsymbol{\rho = slope = \frac{\Delta y}{\Delta x} = \frac{\Delta L_1}{\Delta L_2} = \frac{4.1-2.2}{4.9-2.5} = \frac{1.9}{2.4}}$ = 0.791666666 **g/cm^3 ➔➔➔➔ = 0.79 g/cm^3**
$\frac{\Delta\rho}{\rho} = \frac{\Delta\bar{L}_1}{\bar{L}_1} + \frac{\Delta\bar{L}_2}{\bar{L}_2}$ = (0.3 ÷ 6.8) + (0.3 ÷ 8.0) ➔ (0.04411765) + (0.0375) = 0.08161765
$\boldsymbol{\Delta\rho}$ = 0.08161765× 0.791666666 = 0.06461397 **g/cm^3 ➔➔➔➔ = 0.06 g/cm^3**

(4) Results:

- The density of the liquid is $\boldsymbol{\rho = 0.79 \pm 0.06}$ **g/cm^3**

(5) Conclusions:

$\boldsymbol{\rho \pm \Delta\rho = 0.79 \pm 0.06}$ **g/cm^3**
I need to make the Discrepancy Test to check if the result is accepted or not : **Discrepancy Test = |true value – exp. Value| ≤ 2 × error** = |0.82-0.79| ?≤ 2× 0.06 ➔➔➔ 0.03 ≤ 0.12 (its correct) . **The result is accepted. (The true value = 0.82 that mean the liquid is Paraffin).**
Firstly, After I did the readings and the calculations, I know that the unknown liquid is Paraffin.
In the experiment, the tube contains some dirt and this leads to incorrect measurements because (L1) the Length of the water in the tube and (L2) the length of the oil (paraffin) in the tube will be higher so I will get a wrong result for the density of the liquid and it won't identified and I think this is a systematic error.
Waiting for a minute after adding the liquid allows time for the liquid to settle and stabilize.

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Experiment 3:

L_1 VS L_2

$$p = \text{slope} = \frac{\Delta L_1}{\Delta L_2} = \frac{4.1 - 2.2}{4.9 - 2.5} = \frac{1.9}{2.4} = 0.79$$