



BIRZEIT UNIVERSITY

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Phys111 Report

(+1)
Exp 1

9/11/2022

Experiment #3: Density of a Liquid

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Section:	3		
Date:	20/4/2022		

(1) Abstract:

- Aim of the experiment:

is to calculate the density of a liquid (a certain type of oil).

- The main result is:

▪ The density of the liquid is $\rho = 0.82 \pm 0.08 \text{ g/cm}^3$.

(2) Data:

	1.	2.	3.	4.	5.	6.
L_1 (cm)	2.3	4.5	7.0	8.3	10.8	12.3
L_2 (cm)	2.4	5.0	8.2	10.7	12.8	14.7

$\Delta_1 = 0.1 \text{ cm}$ $\Delta_2 = 0.3 \text{ cm}$ $\Delta_3 = 0.1 \text{ cm}$

$\Delta L_2 = \Delta_1 + \Delta_2$

$\Delta L_1 = \Delta_2 + \Delta_3$

unit

- 0.5

Area
20/4/2022

(3) Calculations:

$$\bar{L}_1 = 7,533^{+0,5} \text{ cm}$$

$$\Delta \bar{L}_1 = \Delta_2 + \Delta_3 = 0,4 \text{ cm}$$

$$\bar{L}_2 = 8,966 \text{ cm}$$

$$\Delta \bar{L}_2 = \Delta_1 + \Delta_2 = 0,4 \text{ cm}$$

$$\rho = \text{slope} = \frac{\Delta y}{\Delta x} = \frac{14,2 - 1}{17 - 0,9} = 0,81987 \text{ g/cm}^3 \Rightarrow 0,82 \text{ g/cm}^3$$

$$\frac{\Delta \rho}{\rho} = \frac{\Delta \bar{L}_1}{\bar{L}_1} + \frac{\Delta \bar{L}_2}{\bar{L}_2} = \frac{0,4}{7,533} + \frac{0,4}{8,966} = 0,0977$$

$$\Delta \rho = 0,0977 \times 0,81987 = 0,080025 \Rightarrow 0,08 \text{ g/cm}^3$$

(4) Results:

- The density of the liquid is $\rho = 0,82 \pm 0,08 \text{ g/cm}^3$

(5) Conclusions:

The density of our oil is $(0,82 \pm 0,08 \text{ g/cm}^3)$. There could be three types of oil. We can eliminate olive oil, because its density is $(0,92 \text{ g/cm}^3)$ and the oil that we used was without colour. So it is not olive oil. This leaves two possibilities, Lubricating $(0,90 - 0,92) \text{ g/cm}^3$, and Paraffin $(0,82) \text{ g/cm}^3$. So Paraffin is more closer to our measured value. In case of Paraffin, The Discrepancy test $(|I_{\text{meas}} - I_{\text{ref}}| \leq 20\%)$ give us $(|0,82 - 0,82| \leq 2 \times 0,08)$ $(0 \leq 0,16)$ an accepted result.

As our result was accepted, there are lots of possible sources of error that we have to be aware of, such as: ① Dirty tube: Since we have a dirty tube the result will be change after that dirt mixed with water, so in this experiment we used (acetone) to be sure that our tube is correctly cleaned. ② Reading measurements in different ways: We must read measurements from concavity or the top of concavity but not both.

We should wait for about one minute after adding the oil to wait the stuck's oil on the tube wall to fall.

l_1 (cm)

(l_2, l_1)

l_1 : the length of water.
 l_2 : the length of oil.

