

Basic Skills for Chemistry
CHEM-1020
Experiment No. 3

Density of a Liquid

Introduction:

The density of an organic liquid will be determined by weighing a measured volume of the liquid and applying the density formula, $\text{density} = \text{mass}/\text{volume}$. The mass of the liquid will be the difference between the mass of an empty graduate cylinder and the combined mass of cylinder and liquid. The volume of the liquid will be read directly in the graduate cylinder. You will do two trials, using different amounts of the your assigned organic liquid. If you are not satisfied with either the precision or accuracy of your trials, repeat the experiment until you are satisfied that you've done the measurements correctly. You will calculate an average liquid density from two trials and compare your experimental result with an accepted literature value. (If you do more than two trials, use your two closest density values for calculating the average density.)

Experimental Procedure:

Obtain a numbered or labeled vial containing an organic liquid sample. Most of the liquids used in this experiment have relatively low toxicity, but you should avoid skin contact with them. All the liquids are flammable and should not be exposed to heat, sparks or flames. Inform your instructor if you spill a significant amount of your liquid. Record all data in the table on the next page using black, nonerasable ink. Be sure to record your liquid name or number on the data page.

Trial 1: Weigh a clean, dry 50 mL graduated cylinder on a low-form balance. Record its mass. Add between 10 and 25 mL of liquid to the cylinder. Weigh the graduated cylinder with the liquid in it. Read and record the liquid volume. The mass of the liquid is the difference between the mass of the empty cylinder and the mass of the cylinder plus liquid.

Trial 2: Add more liquid to the graduated cylinder until it contains between 35 and 50 mL. Again, weigh the graduated cylinder with the liquid in it and record its volume. The mass of the liquid is the difference between the mass of the empty cylinder you determined in Trail 1 and the new mass of the cylinder plus liquid.

Conclusion: Pour the organic liquid back in the original bottle, securely cap the bottle and return the bottle to the laboratory supply cart. Shake excess liquid out of your graduate cylinder. Wipe your work area down with a wet sponge.

Report: On page 3, clearly show the setups and steps you use to carry out the calculations. Your instructor will explain the per cent error formula for answering report question 4. This equation is frequently used to determine how close a measurement is to a "correct" or accepted literature value. Carry out the calculation with caution. Determining the correct numbers of significant figures in the answer may be difficult because the equation involves a mixed calculation, that is, subtraction followed by division.

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Data Page

Liquid name (See Instructor): _____

	Trial 1	Trial 2	Trial 3	Trial 4
Mass of graduate & liquid	_____			
Mass of graduate alone	_____			
Mass of liquid	_____			
Volume of liquid				

Density of unknown liquid from literature: _____

Cite the Reference used: _____

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Report for Density of a Liquid

1. For each trial, calculate the density of your unknown liquid using the density equation $d = m/v$. Show your setups clearly for each density calculation. (8 points)

2. Calculate the average liquid density from your two best trials. Show your setup. (2 points)

3. Name of Liquid _____ Enter the literature value for the liquid density: _____

4. Calculate the percent error of your density determination. Show your work clearly. (4 points)

$$\% \text{ error} = \frac{|\text{reference value} - \text{experimental value}|}{\text{reference value}} \times 100 \%$$

5. Assume that your experiment was conducted at 20°C. Would your density value be different if the experiment had been done at 30°C? Yes or no? Explain your answer and predict how the result would have differed. (3 points)

6. If you had used a 100 mL graduate and 75 mL of liquid, would your density value be different? Yes or no? Explain your answer. (3 points)