Christopher Hunt
CH 201

Post Lab 3: Density of Liquids and Solids

Data and Calculations:

Data Table 1: Volume Measurements

Glassware Type	Volume Reading
100 mL Beaker	37 mL
250 mL Beaker	90 mL
50 mL Graduated Cylinder	41.0 mL
100 mL Graduated Cylinder	38.5 mL

Data Table 2: DI Water

Trial	Buret Volume Reading (mL)	Total Mass (g)	Volume Dispensed (mL)
Initial	3.05 mL	------------------------	-----------------------------
1	7.23 mL	31.16 g	4.18 mL
2	10.80 mL	34.75 g	7.75 mL
3	14.52 mL	38.44 g	11.47 mL
4	18.25 mL	42.20 g	15.02 mL
5	21.85 mL	45.76 g	18.8 mL

Data Table 3: Unknown Liquid B

Trial	Buret Volume Reading	Total Mass	Volume Dispensed
Initial	11.35 mL	----------------------------	-----------------------------
1	14.80 mL	30.08 g	3.45 mL
2	17.99 mL	32.67 g	6.64 mL
3	21.97 mL	35.91 g	10.62 mL
4	25.74 mL	39.00 g	14.39 mL
5	29.05 mL	41.72 g	17.70 mL

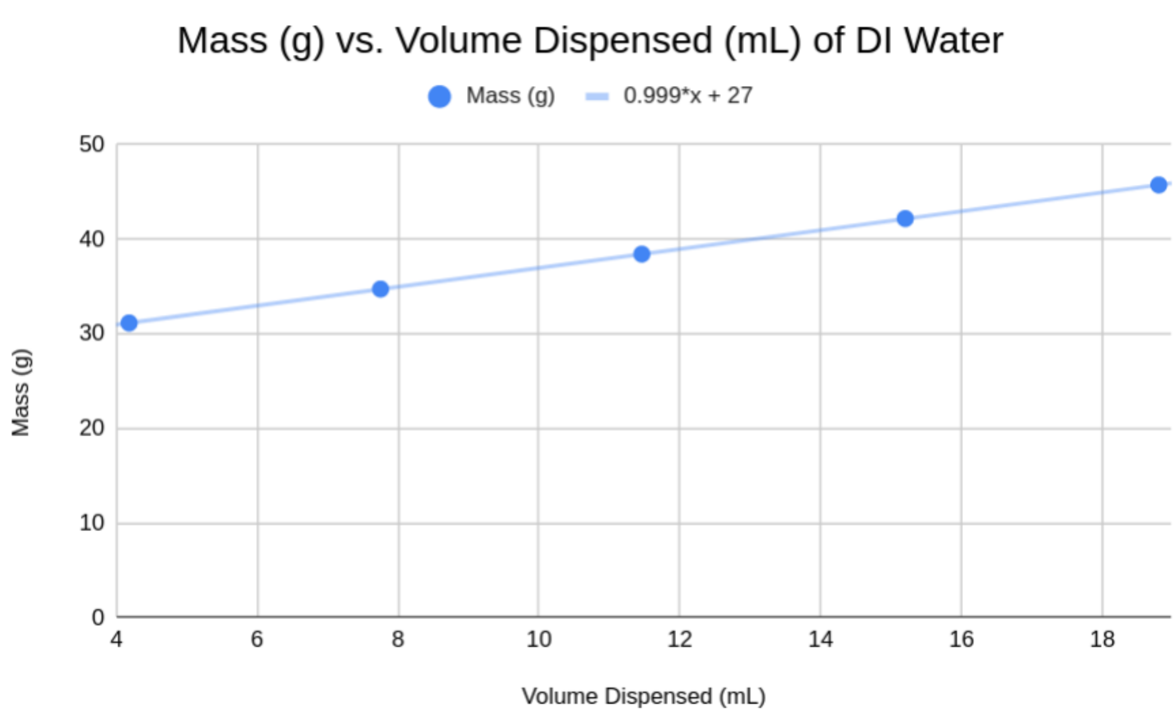
Data Table 4: Green Crayon

Crayon	Length	Diameter	Mass	Cylinder Volume	Density
1	1.25 cm	0.80 cm	0.68 g	0.628 cm^3	1.08 g/cm^3
2	4.15 cm	0.80 cm	2.29 g	2.09 cm^3	1.10 g/cm^3
3	5.55 cm	0.80 cm	3.08 g	2.79 cm^3	1.10 g/cm^3
4	5.92 cm	0.80 cm	3.42 g	2.98 cm^3	1.15 g/cm^3
5	8.17 cm	0.80 cm	4.71 g	4.11 cm^3	1.15 g/cm^3
					Average: 1.12 g/cm^3

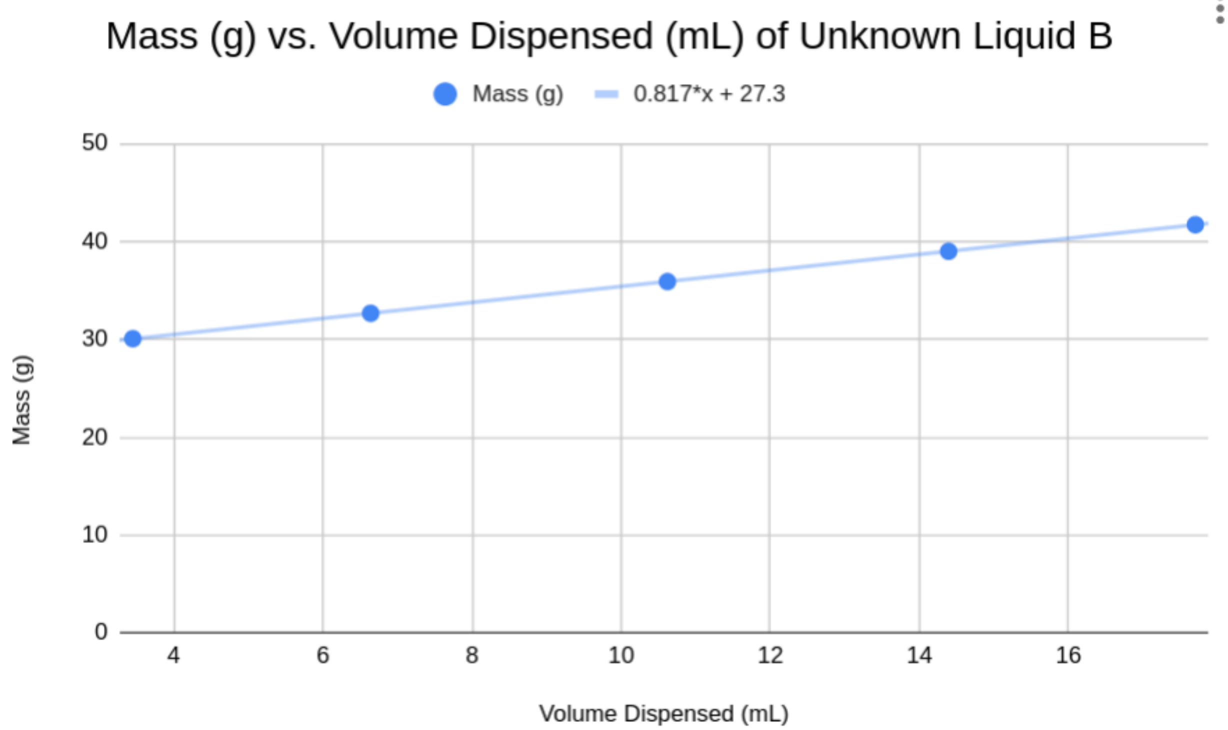
Results:

The density of DI Water was calculated to be 0.999 g/cm^3 (Result Fig. 1). The density of the unknown Liquid B was calculated to be 0.817 g/cm^3 (Result Fig. 2). The cylinder volume and density was calculated using Google Sheets and the formula for volume of a cylinder ($V = L*\pi*r^2$) and density (Mass/Volume), this can be found in Data Table 4. The y-intercept on both Result Fig. 1 and 2 represent the mass of the container the liquid was being poured into.

Result Fig. 1



Result Fig. 2



Result Fig. 3

Liquid	Water	Unknown Liquid B
Trend Line Equation	y = 0.999x + 27	y = 0.817x + 27.3
Density	0.999 g/cm^3	0.817 g/cm^3
Liquid Identity	**Water**	**Ethanol**
Density Percent Error	(|0.999-0.998|/0.998)*100 = 0.100 %	(|0.817-0.0.789|/0.789)*100 = 3.55 %

Result Fig. 4

Solid	Average Density	Percent Error	Percent Range
Paraffin	1.12 g/cm^3	(|1.12 - 1.13|/1.13) * 100 = 0.885%	((1.15 - 1.08)/1.12) * 100 = 6.25%

Discussion and Conclusion:

In this lab, volume and mass was measured of two types of liquid and a solid. These measured values were used, then, to calculate the density of each substance. This relates to the notion that substances have physical properties, such as mass and volume, that can be then used to find physical relationships, such as density. These methods of measurement and mathematical calculations are fundamental to the study of chemistry. Being able to identify the density of a substance allows you to estimate the purity of a substance. The density of a pure substance is usually well-known, so measuring the density of a sample can be used to determine how pure it is.

The two liquid volumes and masses were graphed and the trendline was our experimental density of the liquids. One liquid was DI water and it was found that the liquids density was 0.999 g/cm^3 which has a percent error of 0.1% when compared to the given density of DI water. The second liquid had an experimental density 0.817 g/cm^3 which most closely matched the density of ethanol with a percent error of 3.55%. For the crayon density experiment we found the percent error to be 0.885% and the percent range to be 6.25%. Both the percent error and percent range for the experiment is low, leading to increased confidence in the values measured and calculated. Areas where error could have occurred are when switching from one substance to the next. This percent error could have come from leftover DI water within the buret, skewing the results. Since DI water is more dense, any left on the sides of the buret would potentially settle to the bottom and affect the mass of the measured volumes. This could be mitigated by allowing for a greater dry time between buret uses.