Chem 101 Laboratory
Exercise #1 Laboratory Notebook

Measurement of Volumes and Weight: Accuracy and Precision

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Quad: 2
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In-lab Notes:

Experimental Procedures:

1. For weighing accurately an approximate 1.5 g of NaCl, I used a weigh boat to take the NaCl and then put that (subtracting the weight of the weigh boat) on a balance. The weight is documented in the Final Documentation.
2. Then I transfered the NaCI to a 50.00 mL volumetric flask from the weigh boat and filled to the mark with distilled water.
3. I took a clean dry 50 mL beaker on a balance, documented its weight (1.1).
4. Then I used a 10.00 mL volumetric pipette and transferred 10.00 mL of the NaCI solution from the volumetric flask to the beaker.
5. The weight of the solution without the beaker can be found in the Final Documentation (1.2).

I re-did the experiment for 4 more times.

Final Measurements:
Weight of the NaCl: **1.543g**.

1.1 Weight of the Beaker is **28.501g**.
1.2 Weight of the Solution-01: **11.166g**.

2.1 Weight of the Beaker is **28.503g**.
2.2 Weight of the Solution-02: **10.156g**.

3.1 Weight of the Beaker is **28.506g**.
3.2 Weight of the Solution-03: **10.183g**.

4.1 Weight of the Beaker is **28.508g**.
4.2 Weight of the Solution-04: **10.151g**.

Lab Report

Abstract:

By measuring the volume and weight of samples, the density of a solution of NaCl was determined to be approximately **1.06 g/mL**.

Data/Results:

10.00 mL of NaCl Solution	**#1**	**#2**	**#3**
Weight of sample from Volumetric Pipette	11.166 g	10.156 g	10.183 g
Calculated Density	1.1166 g/mL	1.0156 g/mL	1.0183 g/mL
Average Calculated Density of NaCl Solution	1.050166667 g/mL ≅ 1.06 g/mL		
Standard Deviation, σ	0.046988391001277 ≅ 0.05		
%RSD for the density of NaCl Solution	4.474374638% ≅ 4.47%		

Algebraic Equations:

1. Density, **ρ (g/mL)** = $\frac{\text{Weight of NaCl solution,m (g)}}{\text{Volume of NaCl Solution,V (mL)}}$
2. Standard Deviation, **σ** = $\sqrt{\sum \frac{(\text{Density} - \text{Average Density})^2}{(n-1)}}$
3. Relative Standard Deviation, **%RSD** = $\frac{\sigma}{\text{Average Density}} \times 100$

Discussion:

The density of the prepared NaCl solution was determined to be approximately **1.06 g/mL** by measuring four samples of **10.00 mL** of the NaCl solution. The %RSD calculated for these measurements was **4.47%**, indicating good precision and consistency in the measurements. The accuracy of the measurement required the use of a pipette and not a cylinder because **pipettes are designed to deliver precise volumes, ensuring that each 10.00 mL sample is consistent in volume.**

Conclusions:

In this experiment, the measured density of the NaCl solution using a volumetric pipette is **approximately 1.06 g/mL**, with a % relative standard deviation of **4.47%**. These results suggest that the measurements were consistent and reliable, and the use of a volumetric pipette allowed for accurate volume transfers.

References:

1. Reimer, M. et al, Laboratory Manual, Chemistry 101, pp. 13-18. (University of Victoria: Victoria, B.C.). Fall 2022.