CHEM 1110: MOLAR MASS DETERMINATION OF A GROUP IA OR IIA METAL CARBONATE

NAME: _____ **DATE** _____ **STATION #** _____

OBJECTIVE: To determine the molar mass of an unknown metal carbonate by volumetric analysis and identify the metal in the metal carbonate.

PROCEDURE: Refer to Chem 1110 lab manual pages _____

OBSERVATIONS:

DATA:

Unknown vial # _____ [NaOH] = _____ [HCl] = _____

Mass of vial + sample (g) = _____

Mass of empty vial (g) = _____

Mass of unknown Metal Carbonate used (g) = _____

Total Volume of CO_3^{2-} solution prepared (mL) = _____

Table 1: Titration Data

Run #	Volume of CO_3^{2-} solution pipetted (mL)	Volume of HCl pipetted (mL)	Initial Buret reading, V_i (mL)	Final Buret reading, V_f (mL)	Volume of NaOH used $V_f - V_i$ (mL)	End Point Colour & Shade
1						
2						
3						

CALCULATIONS: (*SHOW ONE FULL SET OF CALCULATIONS FOR RUN 1 AND WRITE ANSWERS FOR THE OTHER TWO RUNS IN* ***STEPS 3-6)***

Calculate the percent difference between: Run 1 & Run 2; Run 2 & Run 3; Run 1 & Run 3. The good runs are within 1% difference.

$$\% \text{ Difference} = \frac{|Run\ \#1 - Run\ \#2|}{\left(\frac{Run\ \#1 + Run\#2}{2}\right)} \text{ x } 100$$

Run 1 & Run 2 Run 2 & Run 3 Run 1 & Run 3

1. Write balanced chemical equation for the reaction between CO_3^{2-} and HCl.

2. Calculate the number of moles of HCl added to each Erlenmeyer flask.

3. Calculate the number of moles of NaOH used for each back titration.

4. Calculate the number of moles of HCl reacted with CO_3^{2-} in Erlenmeyer flask.

5. Calculate the number of moles of CO_3^{2-} present in each 20.00 mL portion of metal carbonate solution.

6. Calculate the number of moles of CO_3^{2-} present in 250.0 ml sample solution.

7. Calculate the molar mass of the unknown **metal carbonate**. And, report the average molar mass of your **metal carbonate**.

8. Calculate the molar mass of the unknown **metal** within the metal carbonate, identify the metal, and state the chemical formula for the metal carbonate.

RESULTS:

Table 2: Summary of Results

Average Molar Mass of unknown Metal Carbonate	
Circle which runs you used to calculate the average	1 2 3

CONCLUSIONS:

QUESTIONS:

1. If not all of the CO2 gas is driven out of solution in the shaking or boing process, how will it affect the final result for your molar mass of the metal carbonate**? Explain your answer following the calculations.**

2. A sample of $BaCO_3$ (MM = 197.00g/mol) has been added to 25.00 mL of 0.2120 M HCl

   $BaCO_3 + HCl$ ---------→ $BaCl_2 + CO_2 + H_2O$

   A back titration of the excess HCl required 22.48 mL of 0.1082M NaOH. Determine the mass of $BaCO_3$ originally present.

3. Explain clearly, why the pink colour obtained at the endpoint of the titration in this experiment gradually disappears over time.