

Determination of the Percent Carbonate in an Unknown Sample Report Tips and Format

**Do not include I, my, we, our, you, or any of these words in any section of the report!
Also, use the same font type and size for all values and words, including tables**

Cover Sheet

Experiment number, title of the experiment, your name, your lab partner's name, date performed (date the data was given), and the due date

ABSTRACT:

Summarizes the purpose and your key findings from the experiment. What was done to accomplish the purpose? The results will include the final standardized concentration of your HCl solution (Average \pm Average Deviation), and your calculated percent CaCO₃ in your unknown (Average \pm Average Deviation). Are these values precise?

INTRODUCTION:

Start with a real-world application tying what was studied in lab conceptually to it. Scientific articles/sources are preferred, and find any references for this as well.

Things to touch on here will be in reference to the pre-lab questions in the procedure, so discuss them here, even the back titration, even though we did not focus on that in lab.

- Also make sure to include the balanced chemical reaction between Na₂CO₃ and HCl and describe it!

MATERIALS AND METHODS:

List of Reagents Used

List all chemicals used including their **names and formulas**, noting if they are primary standards or not. Also, note if any are of a particular temperature, or needed to be heated overnight.

If they are solids to start (and solutions made from them) do not list concentrations. Only of any solutions initially given to you to perform the experiment.

Equipment and Instrumentation Used

List all glassware and non-chemical equipment used, with serial numbers for any instrument.

Summary of Experimental Protocol

Summarize the experimental protocol while also being as detailed as possible. Title each section as they are outlined in the procedure itself.

Important Experimental Parameters and Instrumental Conditions

Were there any particular notes needed for the solutions and solids here? Check the materials in the procedure.

Safety

List all chemicals used here, along with a citation linked to an MSDS document. A reference must be used for each one.

Statistical Protocols (must be typed out)

Average, Average Deviation, Standard Deviation, Relative Standard Deviation (there is no Percent Error to be done here, so do not include it!)

RESULTS AND ERROR ANALYSIS:

Standardization of a Solution of HCl

- Observations – of the solids and solutions made, when the indicator was added, during the titration, and at the endpoint
- **Raw data table** – (Trial #, masses of Sodium Carbonate, Initial Volume, Final Volume, Volume HCl used)
- Give the chemical reaction for this experiment
- Calculations:
 - Final – Initial Burette volume
 - Calculated concentration of HCl based on one trial (will only need to show one example, but must show all conversions and units)
- **Calculated data table** (Trial #, Amount of Sodium Carbonate used, Volume of HCl used, Calculated Concentration of HCl)
- Statistical Protocols – Average, Average Deviation, Standard Deviation, Relative Standard Deviation
- The HCl concentration was determined to be $[HCl] \pm \text{Average Deviation (M)}$.

Determination of the Percent Carbonate in an Unknown

- Observations – of the solids and solutions made, especially in comparison to what was seen during the standardization section, during the titration, and at the endpoint
- **Raw data table** – (Trial #, masses of unknown carbonate, Initial Volume, Final Volume, Volume HCl used)
- Calculations:
 - Final – initial Burette volume
 - Percent Calcium Carbonate in the unknown carbonate calculation (will only need to show one example, but must show all conversions and units)
- **Calculated data table** (Trial #, Amount of unknown carbonate used, Volume of HCl used, calculated percentage of Calcium Carbonate)
- Statistical Protocols – Average, Average Deviation, Standard Deviation, Relative Standard Deviation
- The percent Calcium Carbonate in the unknown was determined to be $[\%CaCO_3] \pm \text{Average Deviation}$.

DISCUSSION/CONCLUSIONS:

- Restate observations from the procedure starting with the solids, then the solutions, and proceeding through the titration itself. Were there differences in the appearance of the sample for the standardization and the unknown?

- State all determined results and calculated concentrations of the standardized HCl solution (Average \pm Average Deviation), and your calculated percent CaCO₃ in your unknown (Average \pm Average Deviation).
- Discuss sources of error for both parts. What was done during the rinsing? The weighing? Using the burette? During the progression of the titration, including examining the color changes occurring?

REFERENCES:

Separate page at the end, numbered in the order used in the report, and must be included in ACS format.

PRE-LAB QUESTIONS:

Must be included at the very end, and on a separate page as well.