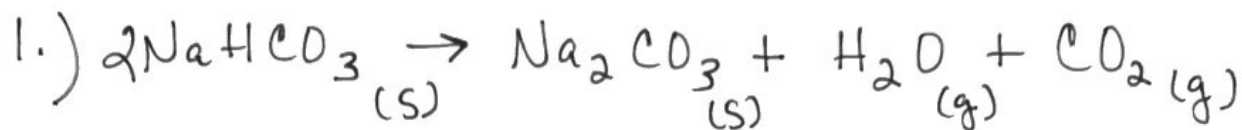


# Thermal Gravimetric Analysis Lab (2020)

## Prelab



2.) Heat, cool, and mass repeatedly until mass is constant.

3.) 
$$\frac{1.000\text{g NaHCO}_3}{1} \times \frac{1\text{mol NaHCO}_3}{84.01\text{g NaHCO}_3} \times \frac{1\text{mol H}_2\text{O}}{2\text{mol NaHCO}_3} \times \frac{18.02\text{g}}{1\text{mol H}_2\text{O}} = .1072\text{g H}_2\text{O}$$

$$\frac{1.000\text{g NaHCO}_3}{1} \times \frac{1\text{mol NaHCO}_3}{84.01\text{g NaHCO}_3} \times \frac{1\text{mol CO}_2}{2\text{mol NaHCO}_3} \times \frac{44.01\text{g CO}_2}{1\text{mol CO}_2} = .2619\text{g CO}_2$$

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.3691 g gas

4.) materials:  
procedures:

5.) data:

mass of empty crucible	28.832 g	}
mass of crucible & mixture before heating	32.332 g	
mass of crucible & mixture after 1 <sup>st</sup> heating	31.614 g	
after 2 <sup>nd</sup> heating	31.592 g	
after 3 <sup>rd</sup> heating	31.592 g	gas

## Calculation

1.) Mass of mixture before heating:

$$\boxed{32.332 \text{ g}} - \boxed{28.832 \text{ g}} = 3.500 \text{ g mixture}$$

cruc + mix      empty cruc      mix

2.) Mass of gas lost:

$$\boxed{32.332 \text{ g}} - \boxed{31.592 \text{ g}} = .740 \text{ g gas escaped}$$

Before      AFTER

3.) Mass of  $\text{NaHCO}_3$  in mixture:

$$\frac{.740 \text{ g gas}}{1} \left| \frac{1.000 \text{ g NaHCO}_3}{.3691 \text{ g gas}} \right. = 2.00 \text{ g NaHCO}_3$$

4.) % Composition of Mixture:

$$\% \text{ NaHCO}_3 = \frac{2.00 \text{ g NaHCO}_3}{3.500 \text{ g mixture}} \times 100 = \boxed{57.1\% \text{ NaHCO}_3}$$

experimental value

$$100 - 57.1 = 42.9\% \text{ NaCl}$$

experimental value

Actual Amounts Used:

- 1.561 g NaCl

- Added  $\text{NaHCO}_3$  to make a total of 3.476 g

$$\frac{1.561 \text{ g NaCl}}{3.476 \text{ g mixture}} \times 100 = 44.91\% \text{ NaCl} \quad 55.09\% \text{ BS}$$

- Percent Error

$$\left| \frac{42.9 - 44.91}{44.91} \right| \times 100 = 4.48\%$$

Actual value → accepted value

# Post-lab Questions

1.) So gases can escape

2.) \* Recorded mass of mixture after heating will be too low.

\* Therefore calculated mass of gas lost will be too high.

\* And calculated grams of  $\text{NaHCO}_3$  in mixture will be too high.

\* % by mass of  $\text{NaHCO}_3$  will be overstated  $\rightarrow \frac{\text{g NaHCO}_3}{\text{g mixture}} \times 100 = \% \text{NaHCO}_3 \leftarrow \text{overstated}$  overstated.

3.) \* One component of the mixture decomposes to release gas.

\* The other component does NOT decompose when heated.

\* Components should not react when heated

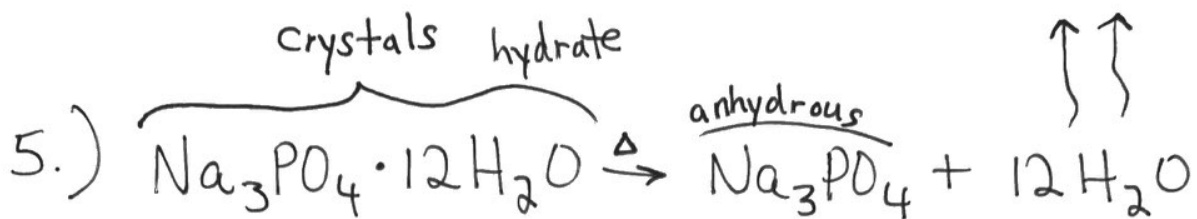
4.) Student's %  $\text{NaHCO}_3$  w/Error

$$\begin{array}{l} \text{mixture B4 heat} = .966 \text{ g mix} \\ \text{mass of gas lost} = .315 \text{ g gas} \\ \frac{.315 \text{ g gas} \times 1.000 \text{ g NaHCO}_3}{.3691 \text{ g gas}} = .853 \text{ g NaHCO}_3 \\ \frac{.853 \text{ g NaHCO}_3}{.966 \text{ g mix}} \times 100 = 88.3\% \text{ NaHCO}_3 \end{array}$$

Student's %  $\text{NaHCO}_3$  w/o Error

$$\begin{array}{l} \text{mixture B4 heat} = .966 \text{ g mix} \\ \text{mass of gas lost} = .338 \text{ g gas} \\ \frac{.338 \text{ g gas} \times 1.000 \text{ g NaHCO}_3}{.3691 \text{ g gas}} = .916 \text{ g NaHCO}_3 \\ \frac{.916}{.966} \times 100 = 94.8\% \text{ NaHCO}_3 \end{array}$$

$$\left| \frac{88.3 - 94.8}{94.8} \right| \times 100 = 6.86\% \text{ error}$$



$$\begin{array}{r} 3\text{Na} \times 22.99 = 68.97 \\ 1\text{P} \times 30.97 = 30.97 \\ 4\text{O} \times 16.00 = 64.00 \\ 12\text{H}_2\text{O} \times 18.02 = 216.24 \\ \hline 380.18\text{g} \end{array}$$

$$\frac{216.24\text{g H}_2\text{O}}{380.18\text{g Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}} \times 100 = 56.878\% \text{H}_2\text{O}$$

