Antacid **Written Signature Assignment**

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*All work must be **very neat** and **organized**. If you need to collect your thoughts, please use a separate sheet of paper. Written Signature Assignments are an **individual effort**. Please submit the completed document to the **Antacid Written Signature Assignment** D2L DropBox folder before the scheduled end of lab.*

1. **Proposal 1 Implementation: Your Group's V_{CO2} vs. m_{base} Data**. In **Table APSA 1** below, present your group's **experimental data** from Session 2 (**Proposal 1** implementation). That is, for your group only, give each member's contribution towards generating data to build a V_{CO2} vs. m_{base} plot for *one* of the **knowns** (either $CaCO_3$ or $NaHCO_3$).

Table APSA 1: Group's Data Contribution to the Class Data Set from Session 2 (**Proposal 1** implementation)

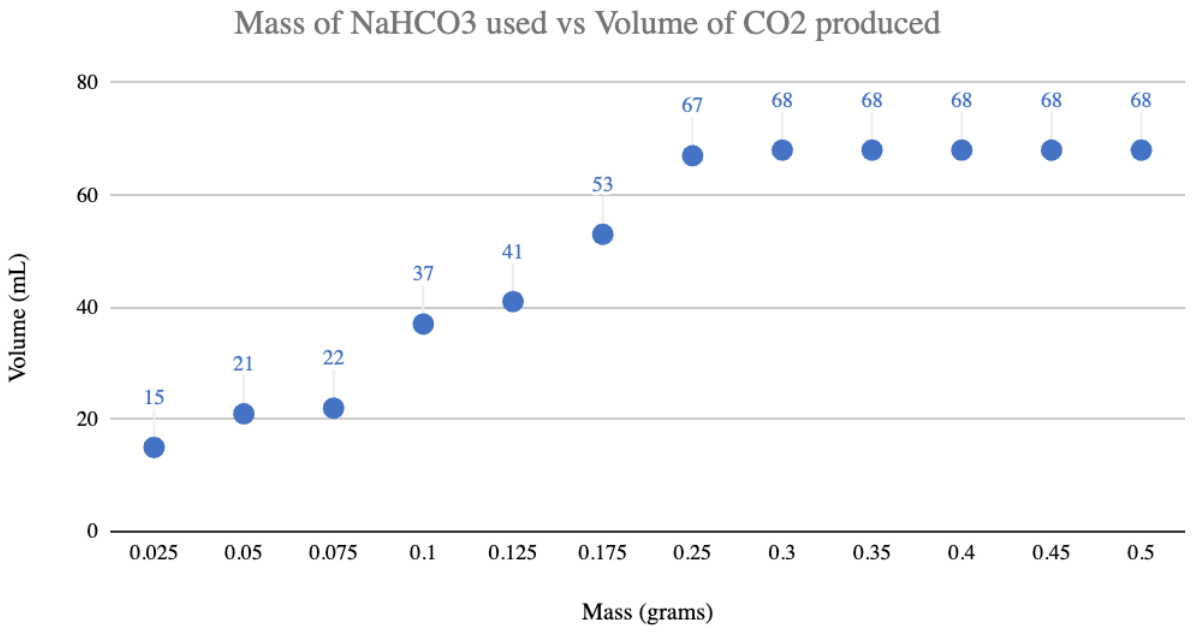
Volume of **0.3 M HCl**	**Mass** of **Base** (Specify $CaCO_3$ or $NaHCO_3$)	**Initial Volume** Reading from Gas Collection Graduated Cylinder	**Final Volume** Reading from Gas Collection Graduated Cylinder	**Volume** of **CO_2** Collected

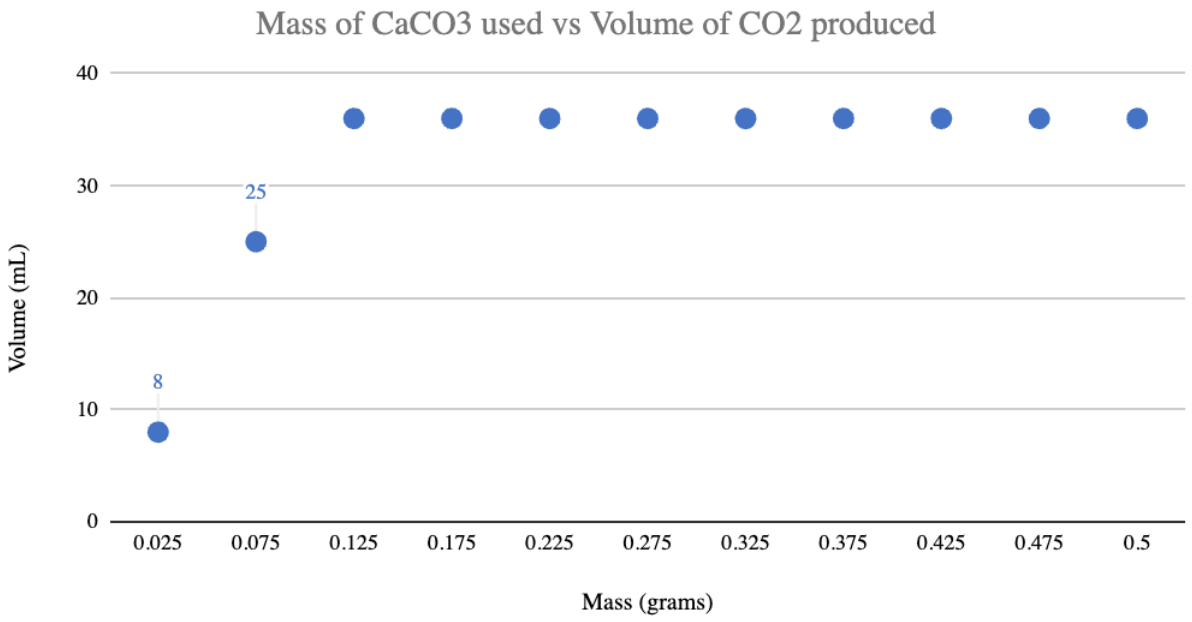
NaHCO3 used	CO2 produced
Mass (grams)	Volume (mL)
0.025	15
0.05	21
0.075	22
0.1	37
0.125	41
0.175	53
0.25	67
0.3	68
0.35	68
0.4	68
0.45	68
0.5	68

CaCO3 used	CO2 produced
Mass (grams)	Volume (mL)
0.025	8
0.075	25
0.125	36
0.175	36
0.225	36

0.275	36
0.325	36
0.375	36
0.425	36
0.475	36
0.5	36

2. ***V_{CO2}* vs. *m_{base}* Graphs**. Paste-in or very accurately draw the V_{CO2} vs. m_{base} plots for the two (2) **knowns** ($CaCO_3$ and $NaHCO_3$) based on the *class data* (which should include your contributions recorded in **Table APSA 1**). Reminder: whenever graphs or plots are presented, you are expected to properly scale, title, and label them using the correct units and appropriate sig figs.




Mass of CaCO3 used vs Volume of CO2 produced
40
30
20
10
0
Volume (mL)
25
8
0.025
0.075
0.125
0.175
0.225
0.275
0.325
0.375
0.425
0.475
0.5
Mass (grams)

3. **Proposal 2 Implementation: Your Group's V_{CO2} vs. $m_{antacid}$ Data**. In **Table APSA 2** below, present your group's **experimental data** from Session 3 (**Proposal 2** implementation). That is, for your group only, give each member's contribution towards generating data to build a V_{CO2} vs. $m_{antacid}$ plot for *one* of the **unknown antacids** (either Equate or Rugby).

For my own trials:

Mass of equate tablet: 1.309 grams
Trial 1: 0.075 g of equate. Starting 4mL Final 19mL: 15mL
Trial 2: 0.1 grams. Starting 5mL Final 21mL: 16mL

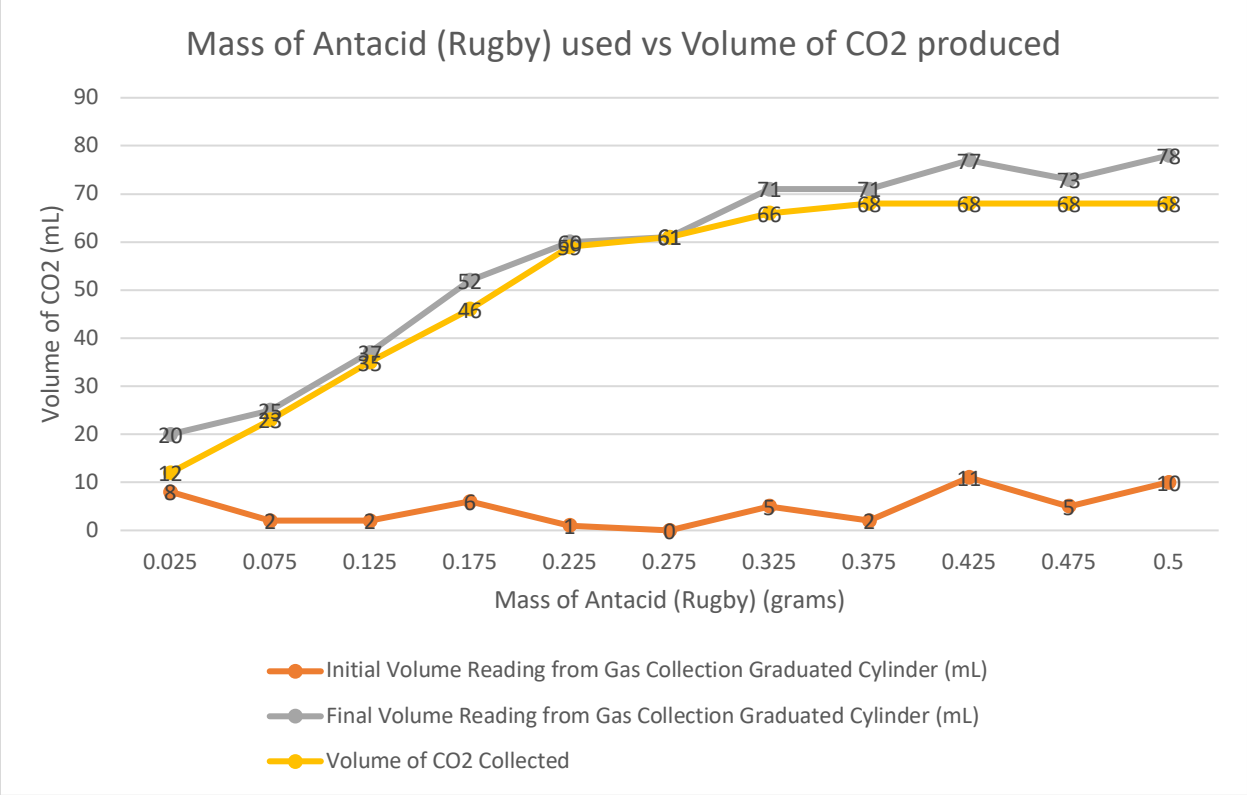
Table APSA 2: Group's Data Contribution to the Class Data Set from Session 3 (**Proposal 2** implementation)

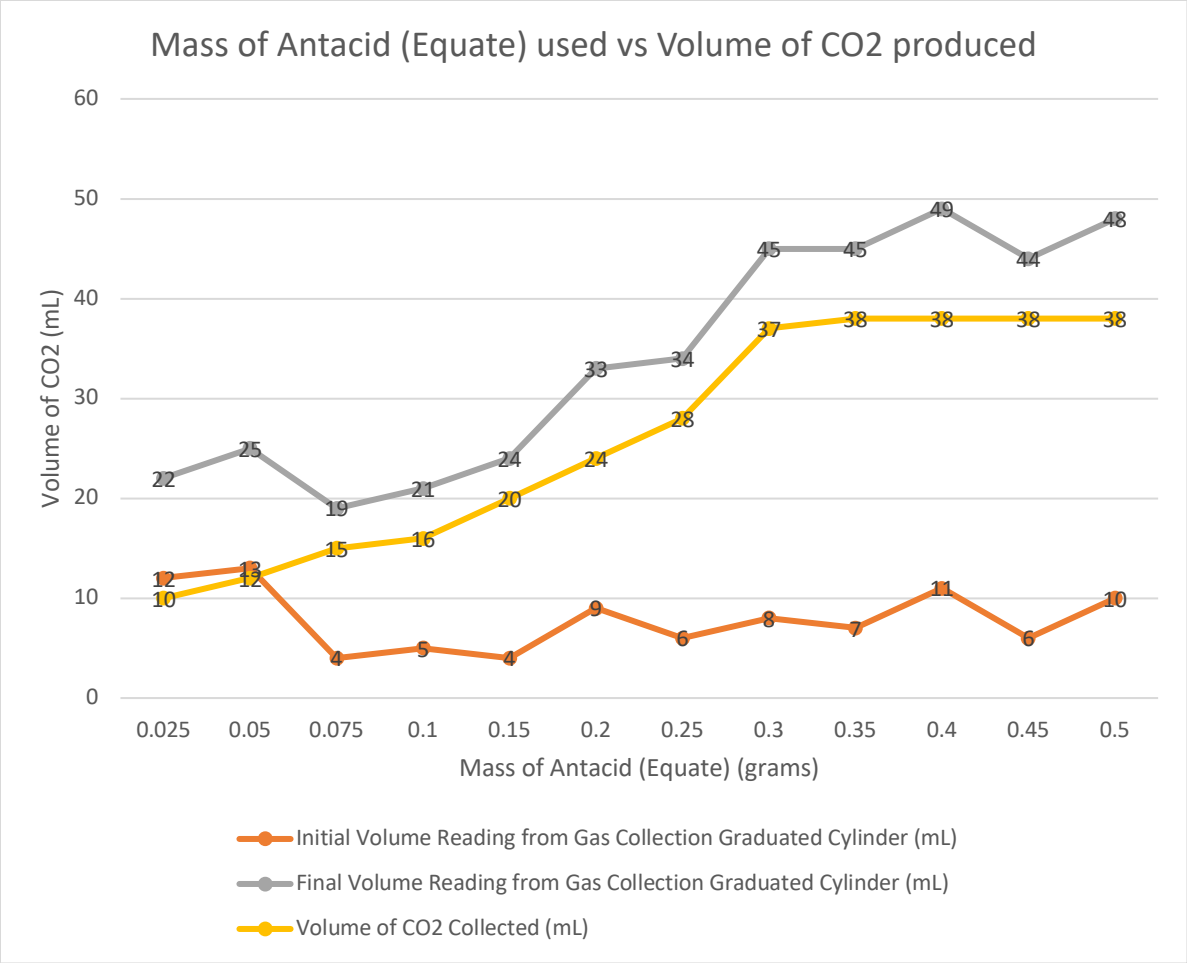
Volume of **0.3 M HCl**	**Mass** of **Antacid (Rugby)**	**Initial Volume** Reading from Gas Collection Graduated Cylinder **(mL)**	**Final Volume** Reading from Gas Collection Graduated Cylinder **(mL)**	**Volume** of CO_2 Collected
10	0.025	8	20	12
10	0.075	2	25	23
10	0.125	2	37	35
10	0.175	6	52	46
10	0.225	1	60	59
10	0.275	0	61	61
10	0.325	5	71	66
10	0.375	2	71	68
10	0.425	11	77	68
10	0.475	5	73	68
10	0.5	10	78	68

Volume of **0.3 M HCl (mL)**	**Mass** of **Antacid (Equate) (grams)**	**Initial Volume** Reading from Gas Collection Graduated Cylinder **(mL)**	**Final Volume** Reading from Gas Collection Graduated Cylinder **(mL)**	**Volume** of CO_2 Collected **(mL)**
10	0.025	12	22	10
10	0.05	13	25	12
10	0.075	4	19	15
10	0.1	5	21	16
10	0.15	4	24	20
10	0.2	9	33	24
10	0.25	6	34	28
10	0.3	8	45	37
10	0.35	7	45	38
10	0.4	11	49	38
10	0.45	6	44	38

10	0.5	10	48	38

4. ***V_{CO2}* vs. *$m_{antacid}$* Graphs**. Paste-in or very accurately draw the V_{CO2} vs. $m_{antacid}$ plots for the two (2) **unknown antacids** (Equate and Rugby) based on the *class data* (which should include your contributions recorded in **Table APSA 2**).




Mass of Antacid (Equate) used vs Volume of CO2 produced
Volume of CO2 (mL)
60
50
40
30
20
10
0
0.025
0.05
0.075
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
Mass of Antacid (Equate) (grams)
22
25
19
21
24
33
34
45
45
49
44
48
12
13
4
5
4
9
6
8
7
11
6
10
10
12
15
16
20
24
28
37
38
38
38
38
Initial Volume Reading from Gas Collection Graduated Cylinder (mL)
Final Volume Reading from Gas Collection Graduated Cylinder (mL)
Volume of CO2 Collected (mL)

5. **Claims**.

a) **Primary active ingredient** in the antacid **Equate** is the base _____ CaCO3_____ .

b) **Primary active ingredient** in the antacid **Rugby** is the base _____ NaHCO3 _____ .

c) **Acid neutralizing capacity** of the antacid **Equate** is _____8.571 M/grams_____ .

d) **Acid neutralizing capacity** of the antacid **Rugby** is _____8 M/grams_____ .

e) **Mass percent of inert components** in the **Equate** antacid tablet formulation is _____64.29%_____ .

f) **Mass percent of inert components** in the **Rugby** antacid tablet formulation is _____20%_____ .

g) The data indicates the commercial antacid of superior **acid neutralizing capacity** is _____Equate_____ .

6. **Justification of the Claims**.

6a. In complete, well-written sentences, succinctly explain how and why the data and results recorded above supports claim **a)**. That is, give your reasoning that defends your claim using the above experimental evidence.

The data from the known experiments that were done, implementing Proposal 1 showed that the data of CaCO3 were similar to the data of Equate. CaCO3 had an inflection point at 36 mL and Equate had an inflection point at 38 mL.

6b. In complete, well-written sentences, succinctly explain how and why the data and results recorded above supports claim **b)**. That is, give your reasoning that defends your claim using the above experimental evidence.

Similar to part a), our data from the known experiments showed that NaHCO3 had the data that was closest in comparison to Rugby. The inflection point for NaHCO3 was 68 mL and the inflection point for Rugby was also 68 mL.

6c. Justify claim **c)** by presenting in a highly organized manner the detailed calculation(s) to determine the acid neutralizing capacity of Equate. [Calculation(s) for the mol_{HCl} neutralized per gram of antacid ($m_{antacid}$)].

$$ANC = \frac{0.3\ M\ x\ 10\ mL\ of\ HCl}{0.35\ grams} = 8.57\ M/grams$$

6d. Justify claim **d)** by presenting in a highly organized manner the detailed calculation(s) to determine the acid neutralizing capacity of Rugby. [Calculation(s) for the mol_{HCl} neutralized per gram of antacid ($m_{antacid}$)].

$$ANC = \frac{0.3\ M\ x\ 10\ mL\ of\ HCl}{0.375\ grams} = 8\ M/grams$$

6e. In complete, well-written sentences, succinctly explain how (citing the important numerical values) you determined the mass percent of inert components in the Equate formulation (mass of inert components divided by the Equate mass times 100) to justify claim **e)**.

To calculate the mass % of inert components, I use the following equation with the Known mass of CaCO3 at its inflection point minus the Unknown mass of Equate at its inflection point.

$$Mass\ \%\ of\ inert\ components\ = \frac{Known\ mass\ at\ inflection\ point\ -\ Unknown\ mass\ at\ inflection\ point}{Mass\ of\ Unknown\ at\ inflection\ point}$$

$$= \frac{0.125\ grams\ -\ 0.35\ grams}{0.35\ grams}\ =\ |-0.6429|x\ 100\ =\ 64.29\%$$

6f. In complete, well-written sentences, succinctly explain how (citing the important numerical values) you determined the mass percent of inert components in the Rugby formulation (mass of inert components divided by the Rugby mass times 100) to justify claim **f)**.

To calculate the mass % of inert components, I use the following equation with the Known mass of NaHCO3 at its inflection point minus the Unknown mass of Rugby at its inflection point.

$$Mass\ \%\ of\ inert\ components\ = \frac{Known\ mass\ at\ inflection\ point\ -\ Unknown\ mass\ at\ inflection\ point}{Mass\ of\ Unknown\ at\ inflection\ point}$$

$$= \frac{0.3\ grams\ -\ 0.375\ grams}{0.375\ grams}\ =\ |-0.2|x\ 100\ =\ 20\%$$

6g. In complete, well-written sentences, succinctly justify claim **g)**.

For the ANC value, the one with the higher ANC is the superior neutralizer as it needs less mass of the bass to reach its inflection point and neutralize. In this case it is Equate as it needs only 0.35 grams compared to Rugby's 0.375 grams.

7. **Reflection 1**. In complete, well-written sentences indicate the important chemical ideals or concepts you learned through this *Project*.

I learned about neutralizing a base, how to determine how much of a base is needed to neutralize an acid. I learned that through the production of CO2 and understanding the relation between amount of CO2 produced and the amount of base needed to neutralize an acid, we can then determine which base is more effective at neutralizing the acid by looking at the Acid Neutralizing Capacity through knowing the mass of the base at its inflection point. The base with the lower mass is going to produce the higher ANC, but a higher ANC value indicates that the base is more superior at neutralizing the acid.

8. **Reflection 2**. How could you apply what you have learned in this *Project* to other contexts for practical purposes? (That is, discuss how and why what you learned in this *Project* may be important in your life, your studies, or future profession.)

I would most likely apply this in the future in medical settings when administering drugs in patients. For example, neutralizing stomach acid in gastric reactions, I will provide a base that will neutralize the acid as quickly and as efficiently as possible.