Antacid **Proposal 1**

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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. Proposals are a **group effort**. Please submit the completed document as a PDF to the **Antacid Proposal 1** D2L DropBox before the scheduled end of lab.*

1. In a complete, well-written sentence, summarize in your own words the **overall goal(s)** for the *Antacid Project*.

The overall goals for the Antacid project are to use an acid-base system that generates gas as its product, controlling the variables to characterize the reactions and how much product is formed. The amount of gas produced will then allow us to discover how much of a base is needed to neutralize a fixed amount of acid. We can then determine the primary active ingredient in an OTC antacid and compare the acid-neutralizing capacity.

2. In your own words, the **goal for this first session** of the *Antacid Project* is…

For session one, our goals for the antacid project include the following. We are to explore the best way to consistently and reliably control the weak base/HCL reaction to plot a VCO2 vs mBase graph that will allow us to identify data for the knowns (CaCO3 or NaHCO3). We will then compare the data with the rest of our peers to compile a class data set that will provide an ample sample size.

3. **Possible Claims for the Project**. In complete, well-written sentences, list some (at least two) of the *possible claims* that could be made in relation to the overall or core goals for this project.

1. The greater the amount of antacid, the greater the gas product. This is due to the fact that we have more moles of a certain substance, therefore, more moles of the product should be produced

2. Different antacids produced different amounts of CO2 regardless of how much antacid is used. For example, keeping the mass the same at 0.5 grams but changing the type of antacid from sodium bicarbonate to calcium carbonate will change the amount of CO2 produced.

3a. Make a list below of the *information or data* that would be needed to support each of the claims listed above.

- Mass of antacid used
- Volume of CO2 produced

3b. For each possible claim given above, write a sentence or two about what you would *expect to see* in the data if the claim was true.

1. We would expect to see a direct relationship between the mass of the antacid and the amount of CO_2 produced, for example, using 0.5 grams of calcium carbonate produced about 38 mL of CO_2. If we decreased the mass of calcium carbonate to say 0.25 grams, we could potentially see that the amount of CO_2 would decrease down to below 35 mL.

2. For 0.5 grams of calcium carbonate, we got about 38 mL of CO_2. And for 0.415 grams of sodium bicarbonate, we had about 68 mL of CO_2. This shows that the amount of CO_2 produced is dependent on the type of antacid used. If we wanted more CO_2, we would most likely use sodium bicarbonate as it has produced more CO_2 compared to calcium carbonate.

4. **Key Exploration Results**. In complete, well-written sentences in your own words, **clearly summarize** the **key results** from your exploration of how best to reliably control the weak base/HCl reaction conditions for the purpose of collecting accurate and precise data to build V_{CO2} vs. m_{base} plots for the **knowns** ($CaCO_3$ and $NaHCO_3$).

From our exploration of the experiment, we have determined that the best way to reliably collect data and ensure minimal errors is to follow the steps in the video detailed in our prelab work. These steps should be followed critically as deferring from said steps will result in inaccurate data or inconsistent results. The following steps are the most crucial in ensuring the best data collection possible. The first step involves filling up the beaker and the graduated cylinder. To ensure that our data is as accurate as possible, we want to minimize and control the amount of air in the graduated cylinder. The best bet is to keep it under 10 mL, however, the lesser the better. Leaving in too much air may cause the water to flood out of the graduated cylinder due to the amount of CO2 coming in being more than the space available in the graduated cylinder. The second step involves being accurate with the amount of HCl used in the syringe. We also want to minimize the number of air bubbles in the syringe as it may drastically affect the data by introducing unwanted reactions. Obviously, no air bubbles are the ideal number, and to achieve this, use a beaker of at least 100 mL and have at least 50 mL of HCl in the beaker. Tilt the beaker a little to allow for the syringe to go as deep as it possibly can whilst reducing the potential of air getting into the syringe. Then extract exactly 10 mL of HCl. Having too much or too little may affect the reaction. HCl is also our control variable and altering this will throw off the data collection as we now will have to also account for the amount of HCl changing. The third step that may drastically affect our data involves putting the J-tube into the graduated cylinder. If not placed correctly, and allowing too much water to escape, it will then affect the data similarly to the first step.

5. **Proposal 1**. Based on your exploration, *clearly specify* your group's contribution towards generating data to build a V_{CO2} vs. m_{base} plot for *one* of the **knowns** (either $CaCO_3$ or $NaHCO_3$). This will require your group to run **multiple reactions** for a given **known** (either $CaCO_3$ or $NaHCO_3$) that are *tightly coordinated* with other groups working on the same **known**, so a proper V_{CO2} vs. m_{base} plot results. *Because each reaction requires time to prepare and monitor, your group's reactions should be divided amongst its members and be run independently. Also keep in mind, half the groups of your lab section should work on* $CaCO_3$*, while the other half focuses on* $NaHCO_3$. Your plan must be complete for just the trials (**multiple reactions**) your group will run and justify the steps. ***Please NUMBER your procedural steps.***

Procedural Step	Justification based on data/observations, or technical instructions, or conceptual understanding

1) Gather appropriate materials for the experiment (50 ml filter flask, 1” magnetic stir bar, bored no.m 1 rubber stopper, 100ml Grad cylinder body, Jtube w/ flexible tubing)	1) Part of the logistics of my experiment
2) Fill your 250 ml beaker and 100ml graduated cylinder with water	2) Making a system able to measure CO2 easily using the given materials
3) Invert the graduated cylinder into the beaker looking to have a small amount of air in your cylinder (<10ml)	3) A continuation of creating a system capable of quantifying the data we are monitoring (CO2 using Water)
4) Take note of how much air was in your graduated cylinder before the running of the reaction	4) You are recording the staring volume of air so that you are able to determine the increase in CO2 at the end of the experiment having less than 10 ml of air in the graduated cylinder monitors anything that can ruin the credibility of my experiment
5) Place Jtube into your beaker and graduated cylinder system careful not to alter the air already in the sytem	5) A continuation of creating a system capable of quantifying the data we are monitoring (CO2 using Water)
6) Carefully measure out your sodium bicarbonate into your filter flask (careful not to have a mass more than 0.5g and no less than 0.025 g.)	6) Making sure to have proper results and no outliers in the class data set a measurement of <.025g is to small and a measurement >.5g is to high
7) Place your magnetic stir bar into the vial and seal it with the rubber stopper	7) The part of the experiment ensuring that the reaction is happening appropriately by being mixed properly
8) Attach the filter flask to the jtube mentioned in step 5	8) Creates a seal between the water system made to measure CO2 and the reaction itself in the vial
9) Fill a 10ml syringe with HCL (hydrochloric acid) ensuring there are no air bubbles	9) Part of the logistics of my experiment (monitoring anything that can ruin the credibility of my experiment)
10) Make sure the filter flask and jtube system are securely placed near the hot plate and properly attached to the hot plate	10) Ensuring ones safety and the running of the experiment without error
11) Insert your HCL syringe into the filter flask and empty the contents	11) Part of the logistics of my experiment
12) Slowly turn up the stir dial on the hot plate slowly increasing the speed of the stir bar	12) Ensuring that the mix of the reaction is happening at a rate you’re able to monitor
13) Monitor the reaction for about 10 min. or until your graduated cylinder system is no longer seeing an increase in CO2	13) The reaction should be done after about 10 minutes. Also if there is no longer any air bubbles (CO2) entering your water system for a steady amount of time the reaction is more or less over
14) Record your ending volume of the graduated cylinder	14) Monitoring the amount of CO2 produce from the reaction of HCL and Sodium Bicarbonate]
15) Repeat for a different mass of sodium bicarbonate and compare the data with the first trial.	15) Gathering a second set of data so that you have data to compare and draw conclusions and analysis from