

Acid-base titrations: analysis of antacid tablets essay sample



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This experiment was performed to learn the technique of acid-base titration and to compare the efficiency of commercially available antacids by looking at their weight of HCl and weight of antacid values. The analysis of antacid tablets was highlighted in this experiment. The efficiency of antacid tablets was determined and compared when the number of grams of HCl can be neutralized by 1 gram of the tablet was found. First, the two antacid tablets (Kremil-S) were crushed and weighed to the nearest 0.01 g which was 0.5003 g and 0.5014g. Then, transferred into a 250 mL flask and added 50.0 ml 0.1M HCl using an acid burette. Then, the antacid was dissolved in the acid. After that, the two drops of phenolphthalein indicator were added and was mixed thoroughly. Lastly, the antacid mixture was titrated with 0.1 M NaOH the solution turned to a faint pink color. Recorded the final volume of NaOH used. Here, two trials were done. After the procedures, the weight of HCl that reacted with 1 gram of antacid tablet was calculated and found the result of 0.31 HCl per gram of antacid tablet. With the recovered amount of HCl, it was found out that the antacid tablet (Kremil-S) that has been tested were not so efficient. The experiment that has been conducted only shows how antacid tablets counteract acidity by reacting with the excess hydrochloric acid in the stomach and its effectiveness as one of the most widely used self-prescribed medicine.

INTRODUCTION

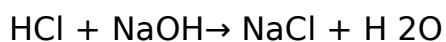
Antacid tablets are probably one of the most widely used self-prescribed medicines. They are taken to relieve the medically underlined conditions of heartburn on acid indigestion and sour stomach. Excessive hydrochloric acid in the stomach causes a feeling of discomfort and a burning sensation

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beneath the breastbone resulting from a spastic backflow of this acid content into the esophagus.

Antacid tablets counteract acidity by reacting with the excess hydrochloric acid in the stomach. Some tablets contain $\text{Al}(\text{OH})_3$ or $\text{Mg}(\text{OH})_2$ or both. These components neutralize the excess stomach acids. Antacids are designed to raise the pH level of the stomach from a too-acidic state. Neutral pH is 7, while the normal stomach acid level usually is 2 to 4. Antacids contain sodium, calcium, magnesium or aluminum, or a combination of these. Any of these ingredients can raise pH levels by neutralizing stomach acid.

The efficiency of antacid tablets may be determined and compared by finding the number of grams of HCl that can be neutralized by 1 gram of the tablet. The higher the amount of HCl that can be neutralized by one gram of the tablet, the more efficient is the antacid tablet. In determining the efficiency of an antacid tablet, the volume of unreacted HCl in the antacid mixture is titrated with NaOH. The chemical equation that describes the reaction between HCl and NaOH is



The equation to calculate for the amount of HCl neutralized is

$$M_{\text{HCl}} * V_{\text{HCl}} = M_{\text{NaOH}} * V_{\text{NaOH}}$$

Assuming the density of HCl to be 1g/ml, then the weight of acid that reacts with antacid tablet is equal to the volume of the acid consumed by the

antacid tablet. MATERIALS AND METHODS

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The two Kremil-S tablets were crushed using mortar and pestle. After, the crushed antacids were weighed to the nearest 0.01 g and transferred it quantitatively into a 250 ml Erlenmeyer flask. Also measured 50.0 ml 0.1 M HCl using an acid burette and added this to the crushed Kremil-S. Dissolved the Kremil-S in the acid as completely as possible and added two drops of phenolphthalein indicator into the mixture and mixed thoroughly. Then, the antacid mixture was titrated with 0.1 M NaOH until the solution turned into a faint pink color. Then, we did this in two trials and calculated weight of HCl that reacted with 1 gram of Kremil-S.

RESULTS AND DISCUSSION

The molar mass concentration of an unknown acid or base can readily be determined by a procedure known as acid-base titration. In this procedure, we perform an acid-base neutralization where an acid and base combine and yields into salts and water as what we had done in the experiment.

Table 1. Data and Results

As the table 1 shows the data and results of our experiment, we have done two trials. In the first trial, the weight of the tablet was 0.5003 g while in the second trial; the tablet weighed 0.5014 g (Figures 1A and 1B) as shown below.

Figure 1A & 1B. Weight of the crushed tablet (Kremil-S) using Analytical Balance

The initial volumes of the NaOH used for both the first and the second trial are zero but they differ from the volumes. The final volume of NaOH used in <https://assignbuster.com/acid-base-titrations-analysis-of-antacid-tablets-essay-sample/>

the first trial was 8.8 ml while the second was 6.5 ml also. When the molarity of the solutions was computed, the result was 0.1 M for both the NaOH and HCl. At the end, we calculated the weight of HCl that reacted with 1 g of antacid tablet and found the results of 0.30 and 0.32 HCl per gram of antacid tablet. With the recovered amount of HCl, we found out that the antacid tablet (Kremil-S) that we had tested was not so efficient (Figure 2A & 2B) as shown below. A phenolphthalein indicator was used in order to indicate whether the hydrochloric acid has been neutralized by the sodium hydroxide. It was indicated by the presence of a "faint" pink color.

Figure 2A & 2B. Weight of HCl / gram of antacid tablet (0.30 & 0.32 g HCl / g tablet)

Acid-base titration is the combination of an acid solution with a base solution until one fully neutralizes the other. The one that is fully neutralized of unknown concentration. At the point neutralization, the amount added to reach neutralization determines how much base or acid was in the solution of unknown concentration. The solution of known solution is called "standard solution" or the "titrant". Acid-base titrations are not the only type of titration, but they are the most common.

Yvonne Romero, M. D., of the Gastroenterology and Hepatology Department of the Mayo Clinic in Rochester, Minnesota, explains that antacids are not a long-term solution for chronic acid reflux because of side effects and the potentially fatal complications of chronic acid reflux. Titration involves determining the amount or concentration of an unknown substance, in this case stomach acids and antacids. Antacids increase the pH of the stomach

almost immediately to relieve acid indigestion, heartburn, gastritis, and gastroesophageal reflux disease (GERD). Antacids, like all medications, are attached to a base. Antacids are attached to sodium, calcium, magnesium, or aluminum. Alkaseltzer is sodium-based and should not be taken if you are being treated for high blood pressure.

Maylox and Milanta are magnesium-based antacids and can cause diarrhea or kidney stones with prolonged use. Rollaids are aluminum-based antacids, which can cause constipation. Tums are calcium-based antacids, which can cause kidney stones to form. Acid reflux is stomach acid coming back up to the throat through the esophagus. You may feel a burning sensation during acid reflux. Acid reflux is not a cause for concern unless it is of prolonged duration. Antacids relieve discomfort from heartburn by neutralizing stomach acid. Antacids should be used for no more than two weeks. Side effects of antacids listed by the Mayo Clinic include diarrhea, constipation, and eventually kidney damage. Long-term use of aluminum products weakens bones. Excess calcium shifts the body's acid-base balance to alkaline.

In order to know if all HCl has been neutralized by the NaOH, a phenolphthalein indicator is needed in order to indicate if the hydrochloric acid has been neutralized by the sodium hydroxide. In the experiment, our group was very careful because a drop of phenolphthalein indicator makes a difference, because we knew that if we get a result of a dark pink color then we made the solution a base rather than neutral. The good thing was we were able to obtain our objective and that is to reach only a "faint" pink color. That means that we made a solution neutral. Therefore, without adding a phenolphthalein indicator, there would be no physical change

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occurs so that means that it is almost impossible to indicate whether the hydrochloric acid has already been neutralized by the sodium chloride.

It is necessary to dissolve the antacid as completely as possible in the 0. 1 M HCl because conversely, it is important that we have to dissolve the antacid as completely as possible in 50 ml HCl such that we can get the exact HCl that did not react with the antacid tablet and has to be neutralized with Sodium hydroxide.

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