

Lab Session 8, Experiment 7: Antacids

The stomach secretes hydrochloric acid, which is necessary for digestion of food. However, for a number of reasons the stomach may secrete excess hydrochloric acid that causes discomfort. A number of commercial antacids are available to neutralize the excess acid. It should be remembered that antacids should be consumed in limited amounts in order that the stomach not be made alkaline. In this experiment, several brands of antacid tablets will be compared for their capacity to neutralize hydrochloric acid.

7A Experiment

In this experiment, you will add an antacid tablet to a known quantity of 0.50 M HCl that exceeds the amount required for reaction with the tablet. Standardized NaOH solution will be added to neutralize the excess acid. The millimoles of acid neutralized by the antacid will be the initial number of millimoles of acid minus the number of millimoles of excess acid, which is the number of millimoles of NaOH required.

Chemicals Required: Antacid tablets
0.50 M HCl
NaOH solution
Phenolphthalein indicator

CAUTION:
DO NOT TASTE THE ANTACID
TABLETS USED IN THIS LAB!

1. Dissolve the antacid tablet in 50.00 mL of the 0.50 M HCl solution. Heat very gently and swirl the container if necessary to dissolve the tablet. A small part of the tablet may not dissolve.
2. After dissolving as much of the tablet as possible, add 3 drops of phenolphthalein solution. Since an excess of aqueous HCl solution has been added, the indicator should be colorless. If it is not colorless but rather turns red, add 10.0 mL more of the HCl solution, and note that the total volume of acid is 50.00 mL + 10.00 mL = 60.00 mL.
3. Titrate to the end point with the standardized NaOH solution. The molarity of the NaOH solution will be given on the label of the reagent bottle.

(a) Mass of antacid tested	g
(b) Milliliters of HCl used	mL
(c) Molarity of HCl	mol/L
(d) Millimoles of HCl used = $(\text{mL}_{\text{HCl}} \times M_{\text{HCl}})$	mmol
(e) Milliliters of NaOH used to neutralize excess acid	mL
(f) Molarity of NaOH	mol/L
(g) Millimoles of NaOH used = $(\text{mL}_{\text{NaOH}} \times M_{\text{NaOH}})$	mmol
(h) Millimoles of HCl (total used)	mmol
(i) Millimoles of excess HCl*	mmol
(j) Millimoles of HCl neutralized by antacid [(h)–(i)]	mmol
(k) Mass of CaCO ₃	g
(l) % CaCO ₃ in tablet	%

*Millimoles of excess acid = millimoles of base required to neutralize excess acid.

Different types of antacid tables may be studied in your class. If so, you are encouraged to compare the results.

7B Exercise

1. The active ingredient in one brand of antacid is CaCO_3 .

(a) Write the equation for the reaction between $\text{HCl}_{(aq)}$ and $\text{CaCO}_{3(s)}$.

(b) How many millimoles of $\text{HCl}_{(aq)}$ are neutralized by 0.35 g of $\text{CaCO}_{3(s)}$? _____ mmol

2. Which household substance is frequently used as an antacid? _____

(a) Write the equation for the reaction between this substance and $\text{HCl}_{(aq)}$.

(b) How many millimoles of $\text{HCl}_{(aq)}$ are neutralized by 5.0 g of this substance? _____ mmol

3. Suggest an explanation for why an antacid tablet may not be completely soluble in acid solution:

Report Form 7: Antacids

Name _____

Partner _____ Section # _____

7A Experiment

(a) Mass of antacid tested	g
(b) Milliliters of HCl used	mL
(c) Molarity of HCl	mol/L
(d) Millimoles of HCl used = $(\text{mL}_{\text{HCl}} \times M_{\text{HCl}})$	mmol
(e) Milliliters of NaOH used to neutralize excess acid	mL
(f) Molarity of NaOH	mol/L
(g) Millimoles of NaOH used = $(\text{mL}_{\text{NaOH}} \times M_{\text{NaOH}})$	mmol
(h) Millimoles of HCl (total used)	mmol
(i) Millimoles of excess HCl*	mmol
(j) Millimoles of HCl neutralized by antacid [(h)–(i)]	mmol
(k) Mass of CaCO_3	g
(l) % CaCO_3 in tablet	%

*Millimoles of excess acid = millimoles of base required to neutralize excess acid

7B Exercise

1. The active ingredient in one brand of antacid is CaCO_3 .

(a) Write the equation for the reaction between $\text{HCl}_{(\text{aq})}$ and $\text{CaCO}_{3(\text{sol})}$.

(b) How many millimoles of $\text{HCl}_{(\text{aq})}$ are neutralized by 0.35 g of $\text{CaCO}_{3(\text{sol})}$? _____ mmol

2. Which household substance is frequently used as an antacid? _____

(a) Write the equation for the reaction between this substance and $\text{HCl}_{(\text{aq})}$.

(b) How many millimoles of $\text{HCl}_{(\text{aq})}$ are neutralized by 5.0 g of this substance? _____ mmol

3. Suggest an explanation for why an antacid tablet may not be completely soluble in acid solution:
