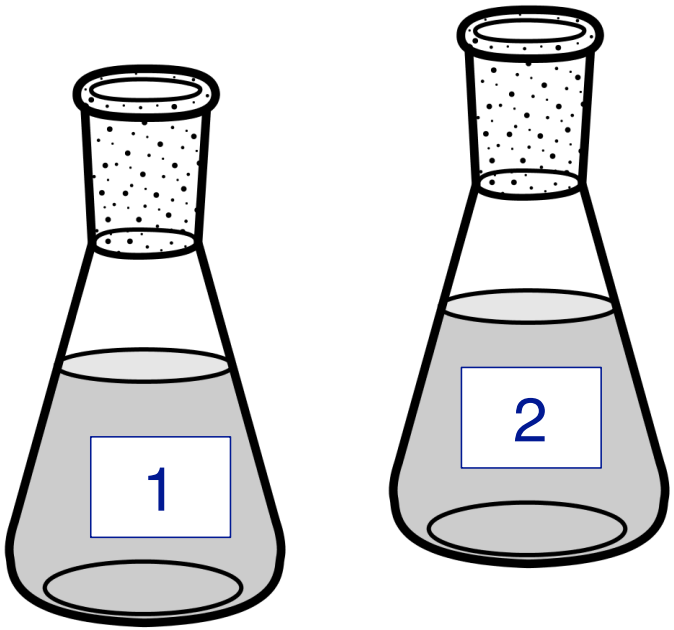
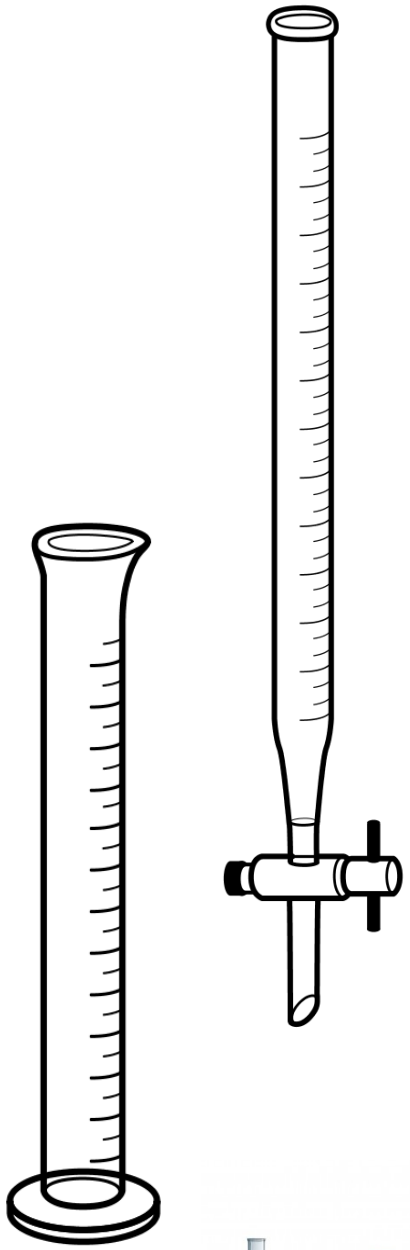
Exp 06: Upset Stomach

Objective: To measure and compare the acid-neutralizing strength of antacids.





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Process: Your stomach dissolves food by releasing hydrochloric acid. Sometimes your stomach can release too much acid. Antacids are bases that remove excessive stomach acid by turning the acid to water (neutralizing the acid).

You will determine the relative strength of two antacids by reacting each with the same amount of acid and then seeing now much of second base, sodium hydroxide (NaOH), is needed to completely neutralize the acid in your test "stomach."

Sodium hydroxide reacts with hydrochloric acid in a double displacement reaction.

$$HCl_{(aq)} + NaOH_{(aq)} \rightarrow NaCl_{(aq)} + H_2O_{(aq)}$$

$$AB + CD \rightarrow CB + AD$$

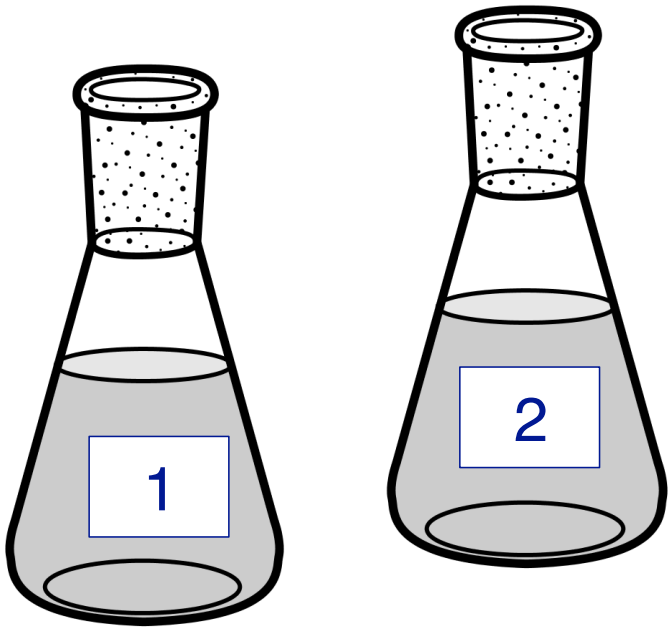
The antacid that needs the least amount (least number of moles) of sodium hydroxide to complete neutralizing the stomach acid is the stronger antacid.

You will use an indicator to know when the neutralization is complete. A few drops of phenolphthalein will be added to each reaction. Phenolphthalein is colorless in acidic solution, as soon as all the acid is gone phenolphthalein will turn the solution pink.

In your conclusions, report the moles of sodium hydroxide required to complete each reaction and which is the stronger antacid.

A Preparing Stomachs

1. With a 100 mL graduated cylinder, measure out 30.0 mL of HCl (aq) solution.
2. Add the hydrochloric acid to a clean dry 125 mL Erlenmeyer flask.
3. Add 2 drops phenolphthalein to the 125 mL Erlenmeyer flask.
4. Repeat to prepare a second 125 mL Erlenmeyer flask.
5. Label the two Erlenmeyer flasks #1 and #2 with a wax pencil.



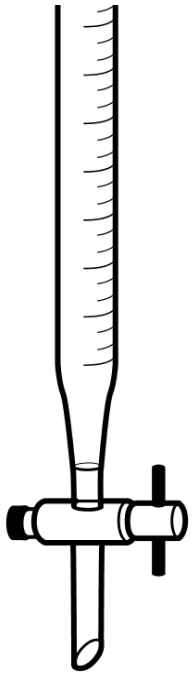
B Adding Antacid

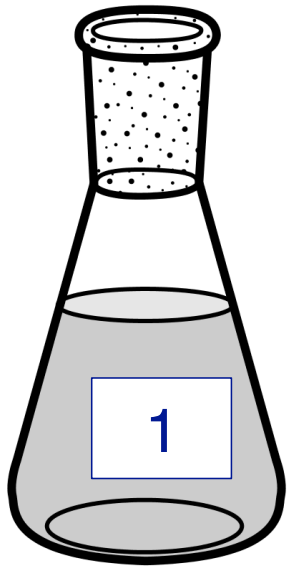
1. Record the brand and active ingredient of the antacid tablet.
2. Prepare the antacid for solution.
    1. Using a mortar and pestle grind the first antacid tablet to a fine powder.
    2. Transfer the antacid powder to a clean dry watch glass.
    3. Weigh and record the weight of your watch glass plus antacid.
3. Slowly add the powdered antacid to your first Erlenmeyer flask (you may need to use a plastic funnel).

    CAUTION: The reaction produces heat, add the powder slowly.
4. When all of the antacid is dissolved in solution, weigh the watch glass.
5. By difference, determine and record the weight of the antacid you used.
6. Repeat the process with your second antacid and your second Erlenmeyer flask.

C Completing the Neutralization

1. Collect 10 mL of 0.50 M NaOH (aq) solution in a 10 mL graduated cylinder.
2. Fill your micro-buret with 0.50 M NaOH solution from your graduated cylinder.
    1. Record the volume of your filled micro-buret.
3. Slowly add sodium hydroxide from your micro-buret to your Erlenmeyer flask.
    1. Add the sodium hydroxide dropwise.
    2. Mix the solution by rotating the Erlenmeyer flask.
    3. The drops will turn pink as they hit the acid solution, the solution will become clear again as you swirl the flask.
    4. As you near complete neutralization the pink color will persist longer.
    5. As you near complete neutralization add drops more slowly.
    6. Stop when you have a persistent, faint pink color.
    7. Record the volume of micro-buret.
    8. By difference determine the volume of 0.50 M NaOH you have added.
    9. Calculate the moles of NaOH you used to complete the neutralization.
4. Repeat the process with your second antacid and your second Erlenmeyer flask.





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Report:

Report you observations and measurements (data). Calculate the moles needed to complete the neutralization after each antacid. Report the moles needed to complete each neutralization and conclude which of the two antacids is the stronger antacid.

$$15.3\ \text{mL NaOH} \times \frac{10^{-3}}{\text{m}} \times \frac{0.50\ \text{moles}}{1\text{L}} = 7.65 \times 10^{-3}\ \text{mol NaOH}$$

Questions?