

AP INQUIRY LAB 03a: How much calcium carbonate is in that antacid tablet?

Your Tasks:

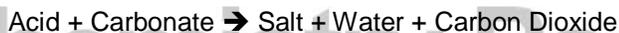
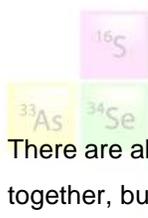
- Answer the **Pre-Lab Questions**
- Read the sections below on **Safety, Background & Prior Knowledge, Equipment Available** and **Chemicals Available**
- To design an experiment (i.e., to outline an experimental procedure) to answer the question posed above. You MUST have your plan reviewed BEFORE you start the experiment
- To produce and turn in, a lab report (see separate document on lab reports)
- Answer the **Post-Lab Questions**

Safety:

- Follow all the normal safety procedures in the laboratory

Background & Prior Knowledge:

- One of the main ingredients in antacid tablets (such as Roloids, Tums etc.) is calcium carbonate, which helps to neutralize stomach acid in the following general reaction;



- There are also a number of other ingredients in these tablets such as binders, that hold the tablet together, but that you can assume contain no calcium or carbonate ions
- In the lab, we can mimic the action of antacids in the stomach by reacting the calcium carbonate with hydrochloric acid (often helped by the addition of a few mL of distilled water and some very gentle heating). The binding materials will not dissolve, i.e., they are insoluble in acid
- Aqueous calcium ions can be precipitated by the use of a solution of carbonate ions
- When relevant, always give thought to dependent and independent variables and controls

Equipment Available:

- Filter papers and funnels, various pieces of normal laboratory glassware (beakers etc.), stirring rods, mortar and pestle, drying oven, hot plate

Chemicals Available:

- Antacid tablets, 3 M HCl, distilled water, 1 M Na₂CO₃

Pre-Lab Questions:

1. Write the chemical equation for the reaction between solid calcium carbonate and aqueous hydrochloric acid. Include state symbols.
2. Write three chemical equations (one full, one ionic and one net-ionic) for the reaction between aqueous calcium chloride and aqueous sodium carbonate.
3. In experiments where precipitates are formed and collected via filtration from aqueous solutions, the failure to completely dry the precipitate always has the same consequence. What is that consequence?

4. The concentration of barium ions in any solution can also be determined via gravimetric analysis. An impure sample of barium nitrate with a mass of 1.234 g, is completely dissolved in water and the resulting solution is reacted with an excess of aqueous sodium sulfate. A precipitate forms, and after filtering and drying, it was found to have a mass of 0.848 g.
 - (a) Write the chemical equation for the reaction of aqueous sulfate ions and aqueous barium ions.
 - (b) What is the relevance of adding excess sodium sulfate?
 - (c) Calculate the % of barium nitrate in the original 1.234 g sample.

Post Lab Questions:

1. Discuss the possible sources of error in your experiment. **BE SPECIFIC.**

2. Would it be possible to estimate the calcium carbonate content of an antacid tablet by precipitation with an ion other than carbonate? Explain your answer.

