

## EXPERIMENT 2

### ANTACID EFFECTIVENESS

#### Introduction

Digestion in the stomach results from the action of gastric fluid, which includes secretions of digestive enzymes, mucous, and hydrochloric acid. The acidic environment of the stomach makes it possible for inactive forms of digestive enzymes to be converted into active forms (i.e. pepsinogen into pepsin), and acid is also needed to dissolve minerals and kill bacteria that may enter the stomach along with food. However, excessive acid production (hyperacidity) results in the unpleasant symptoms of heartburn and may contribute to ulcer formation in the stomach lining. Antacids are weak bases (most commonly bicarbonates, hydroxides, and carbonates) that neutralize excess stomach acid and thus alleviate symptoms of heartburn. The general neutralization reaction is:



The hydrochloric acid solution used in this experiment (0.1 M) approximates the acid conditions of the human stomach, which is typically 0.4 to 0.5% HCl by mass (pH ~ 1).

This experiment will look at the ability of solid antacid tablets (Rennie, Gaviscon, Alka-Seltzer) to neutralize excess acid compare to the ability of crushed antacid tablets to neutralize excess acid. Students will also measure the rate of change in pH of a dilute hydrochloric acid (HCl) solution when antacid tablets are added to it in order to compare their antacid effectiveness.

#### Before you begin

Read the experimental procedure carefully. Then write a safety audit (see page 4), which must be signed by the academic staff demonstrator before you start.

#### Procedure

- 1) Pour 50 cm<sup>3</sup> of the 0.1 M HCl solution into six 250-cm<sup>3</sup> beakers. Carefully add a magnetic spin bar to the beakers.
- 2) Place the first beaker on the magnetic stirrer and immersed the pH electrode in the acid solution without the electrode tip touching the stir bar. Turn on the magnetic stirrer, checking to make sure the pH electrode has contact with the solution but is not interfering with stirring. (Note: if a magnetic stir bar set-up is not available, one student should carefully stir the solution with a glass stirring rod.). When the pH reading has stabilized, record the pH of the solution.
- 3) Drop one whole antacid tablet into this first solution and record the pH every 30 seconds until the antacid tablet is entirely dissolved and the pH reading stabilizes (5-10 minutes, depending on tablet size or antacid brand).
- 4) Place the second beaker on the magnetic stirrer and repeat steps 2) and 3) but this time use a crushed antacid tablet.