

Example Elephant's IA Exploration

Research Question

Does acidity change the rate of aspirin hydrolysis?

Hypothesis

Because acid breaks down molecules, I predict that the higher the pH, the higher the rate of aspirin hydrolysis. When we plot a graph of rate vs pH, it will be linear with a positive slope. The line intersects the origin because at 0 pH there is no acid and so no decomposition.

Background

Aspirin, also known as acetylsalicylic acid, is a medication used to treat pain, fever, or inflammation. Specific inflammatory conditions which aspirin is used to treat include Kawasaki disease, pericarditis, and rheumatic fever. Aspirin given shortly after a heart attack decreases the risk of death. Aspirin, an [acetyl](#) derivative of salicylic acid, is a white, crystalline, weakly acidic substance, with a [melting point](#) of 136 °C (277 °F),[\[3\]](#) and a boiling point of 140 °C (284 °F).[\[133\]](#) Its acid dissociation constant ([pKa](#)) is 3.5 at 25 °C (77 °F).[\[134\]](#)

Acid breaks down molecules. We know this because, in the stomach, hydrochloric acid activates pepsinogen into the enzyme pepsin, which then helps digestion by breaking the bonds linking amino acids, a process known as protein hydrolysis ([IB Chemistry Book](#)). The same should also apply to aspirin.

Method

1. [Make](#) a solution of 10.00 gram of aspirin in 100 cm³ of water.
2. [Add](#) 1.0 M HCl until the solution is pH 1.
3. [Put](#) solution in a water bath at 10 degrees (to make sure it is constant).
4. [Measure](#) the concentration of aspirin [every](#) 10 second for 10 minutes. Write down the values.

5. Repeat steps 1-4 **FIVE** times to get uncertainty.
6. Repeat steps 1-5 at pH 2, 3, 4, 5.

Data Analysis

Plot a graph of Concentration of Aspirin against pH. Make a best fit line and measure the slope to show the hypothesis to be correct.