

## Materials and Procedure

Two bottles of Regular Strength (325 mg) Tylenol® (100 tablets each) were used in the experiment along with 91 milliliters of 5 normal hydrochloric acid and 640 fluid ounces of Amelia pure steam distilled water. The distilled water and acids were poured into Party (Safeway Brand) plastic cups, totaling 120 cups (9 fluid ounces each). A Thermo Scientific Orion 3 Star pH Portable pH meter was used to determine the pH value of each liquid. A stopwatch was needed to record times, and those times were recorded with a pencil in a spiral notebook. For safety, goggles and rubber gloves were worn at all times.

Before the experiment was started, the materials were gathered. Also, the distilled water and acid were kept at room temperature. Eight fluid ounces of distilled water were poured into a plastic cup. Four milliliters of acid were measured with the graduated cylinder and poured into the water, and the substance was stirred ten times clockwise. The end of the pH meter was then placed into the distilled water and acid to measure the pH value. The value was recorded into the spiral notebook. One Tylenol® tablet was dropped into the substance one inch from the surface. The timer was started as soon as the tablet touched the water. The time was recorded when the first piece broke off from the tablet. All of these steps excluding gathering the materials and keeping the liquids at room temperature were repeated for 0.5 milliliters of acid, 0.05 milliliters of acid, and 0 milliliters of acid, completing 20 trials for each. (An eyedropper was used to measure the very small quantities of acid.) To find a pH value of about 5, 0.05 milliliters of Heinz Distilled White Vinegar was poured into 8 fluid ounces of distilled water. The substance was stirred ten times clockwise. Then, the end of the pH meter was placed into the substance, and the pH level was calculated and recorded. One Tylenol® tablet was dropped into the substance one inch from the surface. The timer was started as soon as the tablet touched the water, and the time was recorded when the first piece broke off from the tablet. One milliliter of vinegar and 160 fluid ounces of water were needed to complete this trial. Since vinegar was different from hydrochloric acid, its results were not included. No apparatus was constructed in this experiment. The first time a piece fell off the tablet was recorded with a stopwatch. Based on how long it takes for the first piece to fall off, the pH that dissolves the tablet the fastest can be determined. Also, a ruler was used to measure one inch from the surface of the liquid to where the tablet was dropped.

## Results

The pH of a common drinking liquid did affect the dissolving rate of a Tylenol tablet. The average time it took for a piece to fall off from the tablet in a pH of 0.86 was 53.307 seconds, while the average time in a pH of 1.78 was 45.704 seconds. The average time for a piece to fall off from the tablet in a pH of 2.87 was 36.898 seconds, and the average time in a pH of 7 was 27.517 seconds. There were no outliers in this data. The pH of 0.86 had a range of 12.31, the pH of 1.78 had a range of 7.67, the pH of 2.87 had a range of 8.1, and the pH of 7 had a range of 7.87. These results do support the hypothesis because there is a correlation between the pH of a liquid and the dissolving rate.

Amount of Time It Takes Before A Piece Breaks Off From A Tylenol Tablet (s)

	pH=.86	pH=1.78	pH=2.87	pH=7
Mean	53.307	45.704	36.898	27.517
Minimum	45.76	42.12	32.53	23.73
Maximum	58.07	49.79	40.63	31.6
Range	12.31	7.67	8.1	7.87