

The effect of increasing temperature on the rate of reaction between alka seltzer and water.

Aim: My aim is to find out how increasing the temperature of water effects its rate of reaction with alka seltzer. Alka Seltzer contains sodium bicarbonate, which reacts with water producing Carbon Dioxide. So we are really testing how the temperature affects the rate that the water and Sodium Bicarbonate produce Carbon Dioxide.

Prediction: I predict that the hotter the temperature of the water the faster the reaction will happen. I think this because if the water is hotter then the particles move around more quickly and they will collide with each other more often with more energy. Therefore more reactions are successful and the reaction takes place quicker. If the water is colder then the particles are moving slower and less collisions happen so the reaction takes longer.

Equipment: I did a trial experiment beforehand and discovered that it is best to use 10ml of water and $\frac{1}{2}$ an Alka Seltzer tablet. We are going to test the reaction time by putting the alka seltzer and water in a film container and putting the lid on and timing how long it takes for the lid to pop off. We are going to do the test as a class so we can get more results done and have a better average. I am going to measure the time it takes for the lid to pop off using a Stop Watch. I am going to use a film container because the seal is airtight so no gas can escape and the lid will pop off with pressure.

Stop Watch- time experiment accurately

Alka Seltzer tablet

Water

Kettle- to increase the temperature of the water

Ice- to lower the temperature of the water

Measuring cylinder- measure out 10ml of water

Thermometer- temperature of water

Beaker- to keep water in

I decided to test my experiment using the following temperatures of water: 5,10,20,30,40,50 and 60 ° c. I am going to choose this range because it includes hot and cold temperatures and they have a steady increase. I will only change the temperature of the water and not change the amount of Alka Seltzer. If I get an anomaly in my results I will redo that part of the experiment to correct it.

Method:

Step1: Firstly gather equipment.

Step 2: Heat a beaker of water to 5 ° c using the ice and the thermometer.

Step 3: Measure out 10ml of water using the measuring cylinder.

Step 4: Pour the 10ml of water into the film container and add $\frac{1}{2}$ of an Alka Seltzer tablet.

Step 5: Put on the lid and start the Stop Watch.

Step 6: When the lid pops off stop the Stop Watch and record the time.

Step 7: Repeat the Experiment 7 more times using the same temperature.

Step 8: Repeat steps 1-7 but using 10,20,30,40,50 and 60 ° c water.

Step 9: Find the mean average of each temperature by adding all the results together and dividing by the number of results.

Results:

	5 ° c	10 ° c	20 ° c	30 ° c	40 ° c	50 ° c	60 ° c
Trial 1	43	8.46	6.2	9	3.15	3.09	1.96
Trial 2	41	11.49	7.9	7	6.3	4.07	3.27
Trial 3	41	10.01	8.3	10	3.49	3.5	1.92
Trial 4	42	13.54	7.2	9	4.23	3.25	1.95
Trial 5	43		8		1.63	3.1	3
Trial 6	40		6		5.87	2.8	4
Trial 7	41		8.2		3.37	1.97	2
Trial 8	41		20		3.34	2.34	3
Average	41.5	10.825	7.4	8.75	3.9	3.0375	2.6375

I then drew up my results in a line graph to show the results more clearly and their correlation.

Conclusion: My graph shows that the results have a negative correlation meaning that the hotter the water the faster the reaction. The line of best-fit shows that the results for 30 ° c are anomalous. This could be because there were only four results and they ranged from 7 to 10 seconds. The reason behind this is some groups in the class had a stopwatch that didn't have milliseconds.

Evaluation: I have compared my results with my prediction. My prediction was correct the rate of reaction does increase with a higher temperature. I think that my method was fair. My results could have been more accurate but they were accurate enough to show the correlation of the water and alka seltzer and reach a definite conclusion. If I was to do the experiment again I would use a gas syringe so you could measure the exact amount of gas produced in a set time. I could also crush the alka seltzer, because some of it was crushed and this increased the surface area making the reaction faster. Also you can weigh the alka seltzer so you have the same amount.