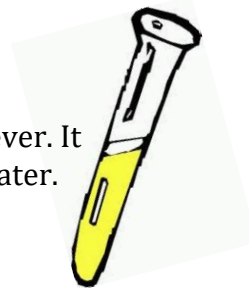


“Uncorked” - Testing the Rate of Reaction

Background Information: Alka-Seltzer is an effervescent antacid and pain reliever. It reacts in water – rapidly dissolving tablets than form a carbonated solution in water.

Problem: What factors affect the rate of reaction of Alka-Seltzer in water?

Hypothesis:



Materials:

- ♦ Alka-Seltzer Tablets
- ♦ Water
- ♦ Test tube and stopper
- ♦ Target
- ♦ Thermometer
- ♦ Stopwatch
- ♦ Hot water
- ♦ Cold water
- ♦ Water at room temperature
- ♦ Mortar and pestle (optional)
- ♦ 10 mL Graduated cylinder

Procedure:

Experiment One: Room Temperature

1. Measure out 5mL of **room** temperature water with a graduated cylinder. Record temperature using a thermometer.
2. Place water into test tube.
3. Break an Alka-Seltzer Tablet into quarters.
4. **Partner A** will place one quarter of the tablet into the test tube. **Partner B** (who is holding the test tube) will quickly place the stopper onto the test tube and aim at the target. **Partner C** will begin the timer as soon as the stopper has been placed on the test tube – stop timer the instant the cork “pops” off. Record this time.
5. Repeat steps 1-4 two more times – do not break new tablets for each trial, use remaining.

Experiment Two: Hot Water

1. Repeat the same procedure as in experiment one using HOT water.

Experiment Three: Cold Water

1. Repeat the same procedure as in experiment one using COLD water.

Experiment Four: Increased Volume of Water

1. Repeat the same procedure as in experiment one using 10 mL of room temperature water.

This investigation / activity has been adapted from:

Mah K, Martha J, McClelland L, et al. *Science in Action 9*. Toronto, ON: Addison Wesley.

Experiment Five: Increased amount of Alka-Seltzer

1. Repeat the same procedure as in experiment one using two quarters of an Alka-Seltzer tablet.

QUESTION: What can you do to ensure that there are no other factors affecting the rate of reaction (anything that is contributing to the cork popping off)? (hint: could you run one more experiment – what would it be? Include a diagram and be sure you do this in your lab!)

Observations:

Measurement	Trial 1	Trial 2	Trial 3
Experiment 1			
Time to Pop Cork			
Water Temperature °C			
Point on target:			
Experiment 2			
Time to Pop Cork			
Water Temperature °C			
Point on target:			
Experiment 3			
Time to Pop Cork			
Water Temperature °C			
Point on target:			
Experiment 4			
Time to Pop Cork			
Water Temperature °C			
Point on target:			
Experiment 5			
Time to Pop Cork			
Water Temperature °C			
Point on target:			

Additional Observations:

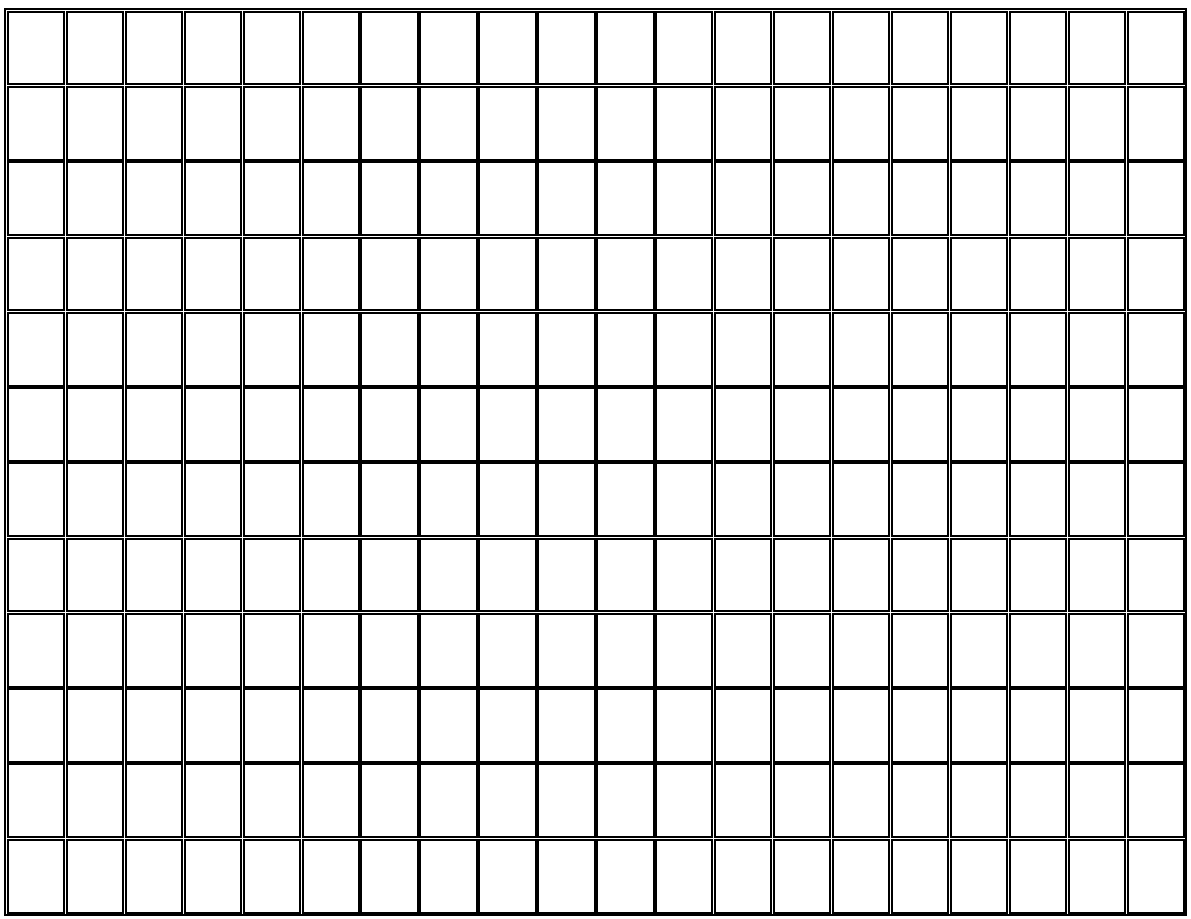
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Analysis:

1. Identify the following variables in each of the experiments:

	Experiment 1	Experiment 2	Experiment 3	Experiment 4	Experiment 5
Manipulated					
Responding					
Controlled (<i>more than one</i>)					

2. Create a graph to demonstrate the temperatures tested in this experiment:



Conclusion:

3. Based on your experimental results, answer the original question "What factors affect the rate of reaction of Alka-Seltzer in water?" *Be sure to discuss and include all significant results.*
4. Compare your results with your hypothesis. Did your results support your hypothesis?
5. A) What are two possible sources of error in this lab? How might these two errors affect your results? (You cannot discuss experimenter error.)
6. If you were to complete this lab again, explain two changes you would make to the **experiment**.

QUESTIONS:

7. Was there a catalyst used in this lab? Why or why not? Be sure to explain the function of a catalyst.
8. Was this an endothermic or exothermic reaction? How do you know this?
9. Place the following terms in the correct place on the general skeleton chemical reaction below: products, reactants, $\text{H}_2\text{O}_{(l)}$, $\text{CO}_{2(g)}$, Alka-Seltzer; energy (there is no designated blank for some terms!)

_____ + _____ \rightarrow _____
10. Design an additional experiment that you could perform to further explore this lab's original problem.

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