

**Blast Off!**

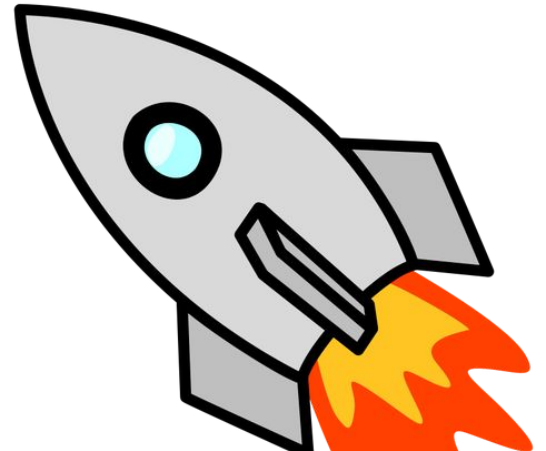
#C17



# PURPOSE & HYPOTHESIS

In this project, I wanted to know what mixture of acid and baking soda will make the biggest reaction to send a rocket as high as possible.

If I use an acid with a higher acid level, then the chemical reaction will be stronger and make more pressure to make the rocket go higher.



# RESEARCH

During my research I learned that baking soda's scientific name is sodium bicarbonate and it is a base. A base is something that falls between 7 and 14 on the pH scale. Vinegar, lemon juice, and Coca-Cola are acids that fall between 0 and 7 on the pH scale. The reason why an acid and base react to each other is because the base takes molecules from the acid and it makes a new compound. It makes gas and water. Gas is what I need to create thrust so the rocket can go up.

I found online that lemon's pH is 2.75, cooking vinegar is 2.5, Coca-cola is 2.52 and cleaning vinegar is 2.5 but the cleaning vinegar is 30% and cooking vinegar is 5%.

I also learned about Newton's 3 laws, thrust, gas, and pressure. One of Newton's 3 laws is "for every action, there is an equal and opposite reaction". I also learned the physics of rockets and types of rockets. There are 2 different types of rockets, solid and liquid.

# MATERIALS

## Rocket

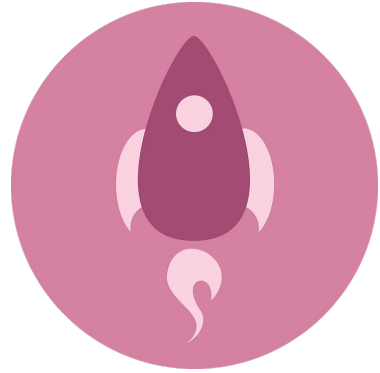
- Empty Jarritos bottle (1.5 L)
- Foam sheet
- Duct tape roll
- 3 chopsticks
- #4 rubber cork
- Scissors
- Ruler
- paper

## Altitude Tracker

- Print out from NASA website
- Card stock (8x11 inches)
- Thread (12 inches)
- 2 Smaller washer or bolts
- Scissors
- Glue

## Experiment

- 10 cups of cooking vinegar (5%)
- 10 cups cleaning vinegar (30%)
- 10 cups lemon juice (about 78 lemons)
- 10 cups Coca-Cola (two 2L bottles)
- 2 ½ cups of baking soda
- Facial Tissue (20 sheets)
- A tablespoon
- A 2 cup measuring cup
- A container to keep at least 10 cups of lemon juice
- Rocket
- Measuring tape
- Stop watch
- A notebook & pencil
- Launch pad (something to mark where your rocket goes)
- Something to mark where to stand for measuring the altitude



# EXPERIMENT

## Prep

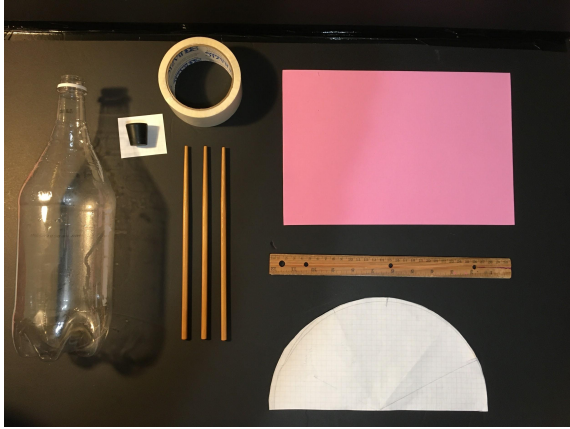
1. Make the rocket with foam, empty Jarritos bottle, duct tape, rubber cork and three chopsticks
2. Make the altitude tracker (follow steps on printout)
3. Make baking soda packets with facial tissue and baking soda
4. Squeeze lemons and then strain them

## Instructions

1. Place your launch pad where you want and measure 30 meters away
2. Mark where you finished measuring (this is where to stand for measuring altitude)
3. Have an assistant put in 2 cups of your acid and then put in your, some of it has to stick out so you have to rip that extra
4. Turn over your rocket and shake it a bit
5. At the same time, start your stopwatch and wait for the rocket to go up, that's when you stop the stopwatch
6. Measure how high it went with the altitude tracker
7. Have fun!

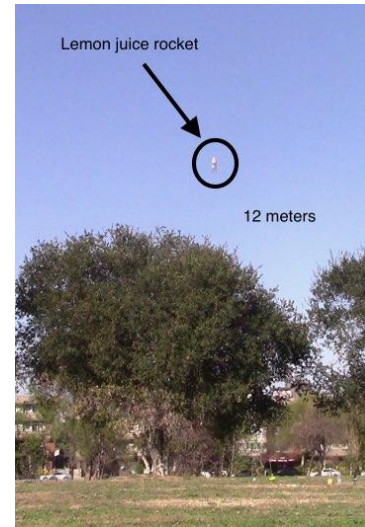
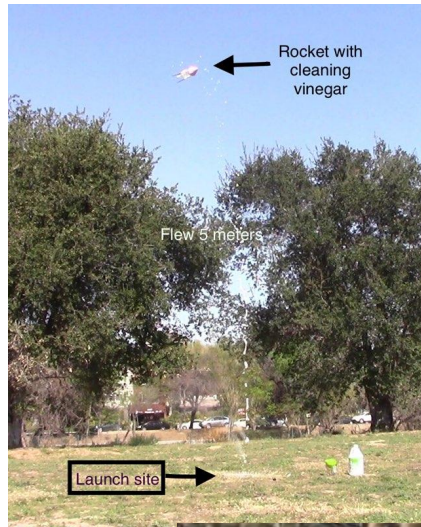


# PHOTOS





First Trial with Cleaning Vinegar



Cooking vinegar



# ANALYSIS

Cleaning Vinegar		
Trial	Time to Blast Off! (seconds)	Heighest Rocket Flew (Meters)
1	16	5
2	7	12
3	9	22
4	9	28
5	4	13

Cooking Vinegar		
Trial	Time to Blast Off! (seconds)	Heighest Rocket Flew (Meters)
1	7	3
2	9	10
3	7	24
4	20	22
5	11	20

The cooking vinegar was leaking

Coca-Cola		
Trial	Time to Blast Off! (seconds)	Heighest Rocket Flew (Meters)
1	3 min	0
2	5 min	0
3		
4		
5		

The coca-cola fizzed but it didn't make enough gas so it didn't do anything

Lemon Juice		
Trial	Time to Blast Off! (seconds)	Heighest Rocket Flew (Meters)
1	33	1
2	30	3
3	15	12
4	48	14
5	50	12

All the lemon juice rockets fizzled but it didn't make pressure that fast



# CONCLUSION

My hypothesis was correct. It was correct because the lower pH means the higher acid level and in my hypothesis, i said that the rocket with a higher acid level would go higher and it did, the cooking vinegar had a higher acid level and a lower pH level.

# REAL WORLD CONNECTION

A real world connection I made was that all rockets need gas, pressure and thrust. For my rocket, the sodium bicarbonate and the acid makes the gas but the gas is sealed in by the cork so the gas makes pressure and when there is too much, it pushes out the cork which makes the thrust that makes it go up.

All scientists have to prepare before they can do experiments, know about chemistry and always be ready. If they don't do it correctly then the experiment could go wrong. This is important to the world because if someone made a liquid rocket, they can use these mixtures.

# WORKS CITED

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