



Audrey's amazing Vinegar and Mentos volcano experiment

EXPERIMENTAL RESEARCH PROJECT

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Introduction

Background information:

- **Magma** is something that comes from volcanos.
- A volcano is a rupture in the crust of a planetary – mass object, such as earth, that allows hot lava, volcanic ash, and gases to escape from a magma chamber below the surface.
- Fun fact. Some volcanos form from tectonic plates which also can form earth quakes.
- When enough magma builds to the surface the volcano erupts.
- BUT humans can't make volcanos with magma and heat.
- Humans can make chemical reactions.
- A chemical reaction is when two substance combine and makes a new substance.
- Not all substances react but when an acid forms with a base carbon dioxide is produced.
- An acid is something that reacts with a base to cause a chemical reaction – sometimes it tastes sour like a lemon. An acid has lots of hydrogen.
- Bases can take hydrogen from acids when they combine.

What gave me the idea:

At first, I wanted to make a volcano for the model's section but then my mum read the guidelines that it wouldn't score well. So, I decided to find out which human-made volcano ingredients makes the biggest reaction.

I'm interested in volcanoes because I like the explosion and the lava coming out is awesome!

When I was at my grandmother's house there was an earthquake, I was very scared because it was the first earthquake I'd ever been in. My grandmother and I looked up what make earthquakes and I learnt about tectonic plates which are deep underground and when they start shaking they make an earthquake and in Japan there are lots of earthquakes. Then I found out about volcanos and that was so cool.

How I got started:

I started by getting the idea when I saw a scientist make a human-made volcano on a science show. I really wanted to learn more so I designed this experiment.

Aim:

I am trying to find out about which human-made volcano will shoot the highest and which will shoot the lowest by combing one solid and one liquid at a time.

Hypothesis:

I think the Mentos combined with the vinegar will shoot the highest and the snake lolly combined with the vinegar will shoot the lowest. I think water with bicarb will cause the middle size reaction.

Methods

Materials

- Mentos (1 packet)
- Beaker (250 mL)
- Large container
- Bicarbonate soda (many teaspoons)
- Coke Cola Zero (1.25 L bottle)
- Water (600 mL)
- Snake lolly (3)
- Paper mâché outer surface
- Glad wrap
- Glass bottle (200 mL)
- Safety glasses
- Lab coat
- Safety mat
- Ruler
- Clipboard



Figure 1: The materials used in this experiment and me with my helpful little sister.

Method: Part 1: making the volcano

1. I scrunched up foil into balls and I stuck the foil onto the bottle.
2. We made the paper mâché volcano. I ripped up paper from an old magazine then I made some glue out of flour and warm water. We painted glue on both sides of the paper then stuck it on the foil balls.
3. I put as many layers as I could to make the shell tough so it could hold the glass bottle in it.
4. The outer layer I made white so I could paint it to look like a volcano.
5. I had to let it dry for 24 hours.



Figure 2: Making the volcano from foil (a) and an old magazine with flour and water (b). I used white paper for the outer layer (c).

6. I painted it by making the top red lava, the middle part was gray for the volcanic rock and then grass at the bottom was green.

7. I had to leave it to dry too for at least one day.



Figure 3: Painting the volcano to make it have grass, the volcanic rock and lava

Part 2: The volcano lava experiment

1. We (my mum helped me) got the ingredients which was coke, Mentos, water, vinegar, bicarbonate soda and lolly snakes.
2. I used a clip board to take notes during the experiment.
3. I made a table so I could take measurements of the explosions and record the data (Figure 4).
4. There were 9 experiments (Table 1).
5. Three solids and three liquids:
 - The liquids were water, coke and vinegar
 - The solids were snake lolly, Mentos and bicarbonate soda



Figure 4: Setting up my table to record the data.

Table 1: The different liquid and solid combinations I used in my experiment. For each experiment I used 1 liquid and 1 solid.

Liquid	Solid
Water	Snake lolly
Water	Mentos
Water	Bicarbonate soda
Coke zero	Snake lolly
Coke zero	Mentos
Coke zero	Bicarbonate soda
Vinegar	Snake lolly
Vinegar	Mentos
Vinegar	Bicarbonate soda

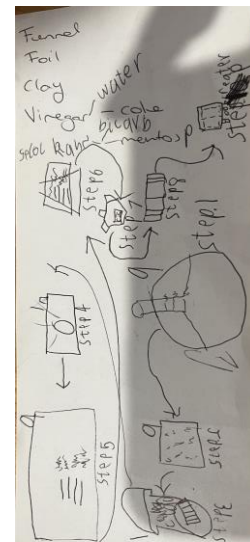
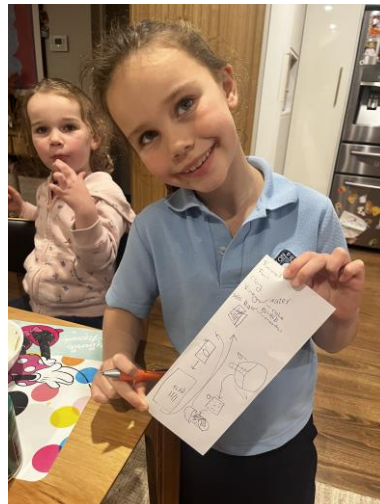


Figure 5: The blueprints of my experimental outline. I had to do this so my mum knew what ingredients to buy. I loved planning.

6. I poured 200 mL of water into the bottle inside the volcano and then added the snake lolly and recorded what happened.

7. I repeated this for each liquid/solid combination



Figure 6: Pouring the liquids into the volcano using a funnel. My sister also helped me by placing the snake lollies in for each of those experiments.

Measurements:

I used a ruler to measure the size of the volcano and time to measure how fast it came out. I also wrote down what I saw (observation).

Safety requirements:

- I had to be careful that the explosion didn't hit the roof. I did this by getting my dad to place a pizza box over the top.

- I protected my eyes and clothes by wearing a labcoat and some lab safety goggles.
- We protected the carpet with towels
- We protected the table using a plastic mat and gauze mat to help any spills.
- I was supervised at all times by my mum.

Results

I used my clipboard and table to record my observations.



Figure 7: Me writing down the numbers after I saw the reactions.

Water experiments:

When I added each of the solids nothing happened. The snake lolly in water looked cool though and when I took it out it was slimy. The size was 0.0cm

Then when I used water and Mentos and nothing happened either. The size was 0.0cm.

The last water one we used water and bicarbonate soda but nothing happened either. The size measured at 0.0cm.

Coke Cola experiments:

The first coke one was coke plus lolly snake and it was also recorded as nothing happening at 0.0cm.

Then we did coke and Mentos. It was huge reaction and measured as 10.9cm. This was more than the capacity of the bottle.

The last coke one we did was coke with bicarbonate soda. A small reaction happened and bubbles came up to the bottle's capacity. I measured this as 1.0cm.



Vinegar experiments:

Our last liquid to test was vinegar.

First, we did vinegar with a snake lolly and it recorded as low 0.0cm where nothing happened.

Our second vinegar one is vinegar with Mentos. It was 0.0cm, but there was 1 bubble.

The last one was vinegar and bicarbonate soda. There was a reaction and it came out in foamy bubbles. It looked really cool. We measured this as 3.2 cm.

Overall, coke with Mentos had a reaction and also vinegar and bicarbonate soda had a reaction. The fastest one was coke and Mentos but the thickest one was vinegar and bicarbonate soda. The coke and Mentos reaction was runnier.

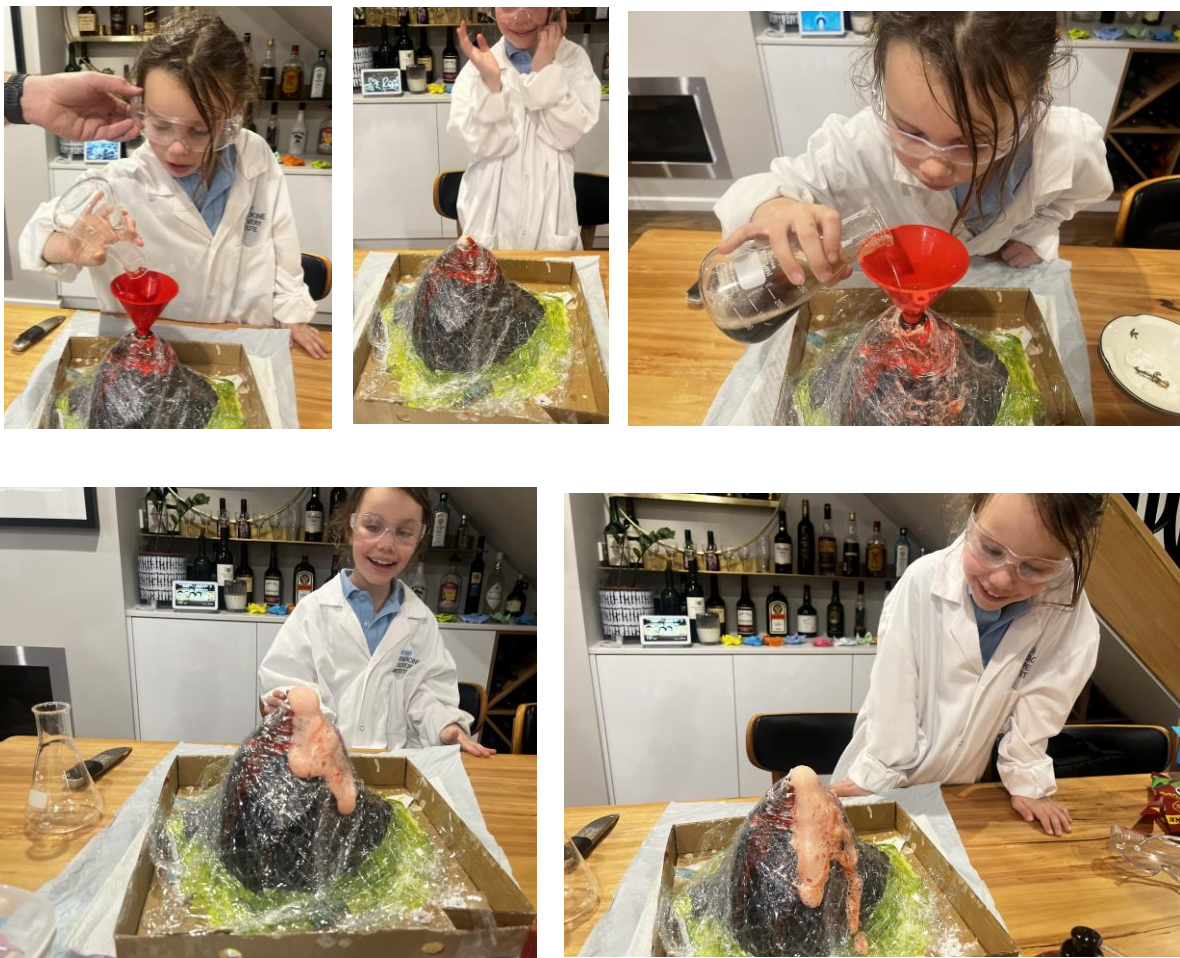


Figure 8: The pictures of the volcanos. Some didn't work but some worked well. The last two photos are of the vinegar with bicarbonate soda

Discussion

I learnt for the human-made volcano that the coke and Mentos had the bicarb and vinegar was big too. Both of them looked really cool but the vinegar and bicarbonate reaction was easier to see and probably the most effective because it had the foaminess and the colour dye was red. The red dye in coke didn't show up.

I learnt that some liquids combined with some solids can have a reaction but other combinations don't.

The results did not reflect my hypothesis. This is because I predicted vinegar with Mentos would shoot the highest but it was vinegar and bicarbonate soda that had a reaction and coke with Mentos that had a reaction.

I think the reason there was a reaction between vinegar and bicarbonate soda is because vinegar is an acid and bicarbonate soda is a base. An acid has lots of hydrogen ions but a base doesn't have many so when they react the hydrogen moves to join the base they release lots of carbon dioxide. This is what makes all the bubbles in the experiment and the volume goes bigger than the capacity of the bottle.

Carbon dioxide is also the reason that the coke and Mentos cause an eruption. Bubbles from the coke attach the Mentos as it sinks and this makes more carbon dioxide to be released creating even more bubbles. As these bubbles move they create more carbon dioxide and the volume is big causing the eruption.

The water doesn't have a reaction because it is neutral. It isn't an acid or a base and so carbon dioxide doesn't get released. The hydrogen bonds are strong and don't change when a snake lolly or Mentos or bicarbonate soda are added. Other things can react with water like some metals. The snake lolly doesn't have a reaction because it is neutral too except the main difference from water is that it is a solid but the water is a liquid.

I found some unexpected results. These were the finding that I thought vinegar and bicarbonate soda wouldn't work but it did. I realise now that because there was an acid and base mixed together I saw an increase in volume because of the carbon dioxide produced during the reaction.

The problems I encountered that were tricky were painting the volcano to make it look like a volcano. It was hard to find out how slow or fast to pour the liquids into the volcano so I could measure it. I didn't know how many Mentos to add to the liquids but we tried one then we tried almost a whole packet and it worked well. It was hard to measure the exact volume change because the bottle was inside the volcano that's why I decided to measure the height with a ruler.

I could improve this experiment by someone else measuring and telling me the numbers to write down but I did both by myself in this experiment. It would be easier to see the changes if the bottle wasn't covered by the volcano. I could get a really large cylinder to do the experiment in so I could measure the exact change in volume but I really wanted to make a volcano this time. I could repeat it a few more times to see if I got the same reaction. I could also try different soft drink types to see if that worked as well as coke cola.

Conclusion

In this experiment I aimed to find out which experiment combination erupted and which ones didn't out of water, coke, vinegar and snake lolly, Mentos and bicarbonate soda. I predicted that Mentos combined with the vinegar will shoot the highest and the snake lolly combined with the vinegar will shoot the lowest. The experiment showed that coke and Mentos came out the highest and fastest but the vinegar and bicarbonate soda had a big reaction but it was thick and foamy and looked amazing! My hypothesis was not right but I loved watching the reactions and I had so much fun making everything.

Acknowledgements

The people who helped me were my little sister, my mum my dad and myself of course. My little helped by helping with the paper mâché and helped me do the experiments by putting the snake lolly into the bottle. She gave me good moral support and she wants to make her own volcano! My mum helped me with the experiment by getting the ingredients and then she put the liquid in the beaker so I could pour it into the bottle. She helped with the safety side of things and gave me a labcoat and safety goggles. She put towels on the floor so it didn't get on the carpet. She helped me with the paper mâché. She took lots of photos and she helped me put them into the report. She did some of the typing when my fingers were too tired but I told her what to write. My dad helped me putting the pizza box a bit lower than the roof to protect the roof if the Mentos and coke shot too high up. He got some tools from the garage like the funnels to help me do the experiment. He gave me good moral support too.



References

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