

# WHEN SHAKEN AND OPENED, WHICH POPULAR CARBONATED DRINK LOSES THE MOST LIQUID?

**FUN FACT:** WHEN YOU SHAKE A BOTTLE CONTAINING A FIZZY DRINK, IT'S BUBBLES EXPAND. WHEN THE BOTTLE IS OPENED, THE BUBBLES GROW AND PUSH LIQUID OUT.

## AIM

We aim to find out which brand of popular carbonated drink loses the most volume of liquid once shaken for ten seconds. Our control will be 1.25L of simple carbonated water to compare to the other beverages we will be using.

## HYPOTHESIS

As a drink is left sitting without being drunk, the carbonic acid decreases, which causes the liquid to lose its fizziness and the liquid becomes flat. An interesting fact we know is if the concentration of carbonic acid in a soft drink is higher, the pH levels are lower, or more acidic.

For this reason, we know that a soft drink with a lower pH is likely to have a higher level of carbonation.

From research, we know that Coca-Cola has the lowest pH of our selected beverages (2.37). For that reason our hypothesis is that Coke has the highest carbonation level and when shaken it would release the most liquid.

## HYPOTHESIS (CONTINUED)

Some other examples of pH levels in soft drinks are Sprite which has a pH level of about 3.2, being more alkaline (less acidic) than Coke which we assume would lose less liquid. Pepsi has a pH level of around 2.39, closer to the level of Coke. From this, we assume Pepsi would fizz slightly less than Coke but more than Sprite, as lower pH levels come from higher carbonic acid concentrations.

## METHOD

- Choose one person to shake all of the bottles.
- That person must rotate one bottle 180 degrees vertically about the X axis for one second then back to its original upright position 10 times
- Open the bottle
- Measure how much liquid is lost by pouring the remaining liquid from the bottle in the 1L measuring jug, if you are left with more than 1L of the drink, pour the rest of the liquid into a 250ml measuring jug.
- Repeat for each beverage while recording each result.

## VARIABLES

Our independent variable is the type of soft drink, manipulating the amount of carbonation. The carbonation will differ between the soft drinks with different pH levels as the more acidic the drink, the more carbonic acid it contains, resulting in more liquid lost.

Our dependent variable is the amount of liquid being lost. This is being affected by the type of soft drinks and their levels of carbonation.

## MATERIALS

- 1.25L Bottle of Coca Cola
- 1.25L Bottle of Sprite
- 1.25L Bottle of No Sugar Fanta
- 1.25L Bottle of Pepsi
- 1.25L Bottle of Mountain Dew
- 1.25L Lightly Sparkling Carbonated Water
- 1.25L Carbonated Water (Control group)
- 1L Measuring Jug

## LIMITATIONS

One limitation we found was that we couldn't exactly find out if we rotated the bottle at the exact same angle and speed. While the person shook got slightly fatigued due to the constant rotating of a heavy filled bottle, we had breaks in between each bottle rotated to let the person rotating rest their arms.

We also couldn't ensure that the bottles we bought have been on the shelf the same amount of time. The longer a carbonated bottle of water sits, the more the level of carbonation loses its intensity. To try and counteract this we attempted to buy bottles with the same best-before date, with each bottle best before around February to early March in 2025.

## CONCLUSION

To sum our experiment up, our hypothesis was nearly correct, with Coke losing 90mL of water, just 30mL less than Pepsi which lost overall the most liquid.

## CONCLUSION (CONTINUED)

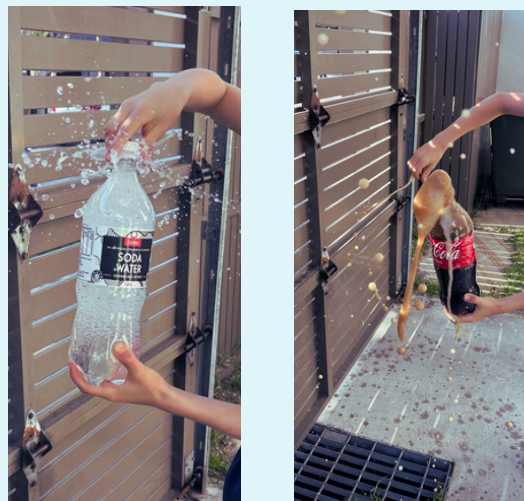
As previously mentioned, drinks that have higher concentrations of carbonic acid have a lower pH level. Coke and Pepsi, the two drinks which lost the most liquid, have the lowest pH levels, confirming part of our hypothesis.

The other part of our hypothesis was partially disproved however, as the drink with the highest pH level in our experiment, carbonated water did not lose the least liquid, Mountain Dew doing that instead.

## WHAT'S NEXT?

After working hard on our experiment, we will obviously have a nice refreshing drink :). We could also complete another experiment similar to ours, only with the infamous Mentos and Coke experiment. We could compare how much liquid is lost with Mentos to without Mentos throughout all the soft drinks using the data from both our experiment and with the Mentos added.

## PHOTOS



## DISCUSSION

After our experiment, we noticed a couple of interesting factors. To begin with, the lightly sparkling Mount Franklin water lost surprisingly more liquid than the normal carbonated water. This shocked us as we assumed a lightly sparkling water would contain a lower concentration of carbonic acid, than a fully carbonated water (according to the packaging\*). Furthermore, the lightly sparkling water also lost more than any other carbonated soft drink, apart from Coke and Pepsi, which are known to have high concentrations of carbonic acids. \*Interestingly, the Mt Franklin Sparkling water contained a higher pH level than the normal Coles carbonated water. It is clear that different companies use different levels of carbonic acid while still advertising the same (or in this case different) type of drink.

## RESULTS

### Amount Of Liquid Lost

- 1.25L Bottle of Coca-Cola - 90mL (pH Level 2.37)
- 1.25L Bottle of Sprite - 25mL (pH Level 3.24)
- 1.25L Bottle of No Sugar Fanta - 35mL (pH Level 2.82)
- 1.25L Bottle of Pepsi - 120mL (pH Level 2.39)
- 1.25L Bottle of Mountain Dew - 5mL (pH Level 3.22)
- 1.25L Bottle of Lightly Sparkling Water - 40mL (pH Level 4.00)
- 1.25L Bottle of Carbonated Water (Control group) - 25mL (pH Level 4.24)

## GRAPH ( ML LOST AND PH LEVELS)

