

# Fizzing Rainbow!

With baking soda and vinegar discover how acid base reactions occur and what this means on an atomic level! This is made even more visual by creating rainbows or designs with food coloring.

## Instructions

### Materials

- Baking Soda
- Vinegar
- Food Coloring
- Dropper/Pipette
- Plate

### Steps

1. On a plate, pour a thin layer of baking soda. This can be arranged into a shape, design, or just covering the plate. This should be enough to cover the area where the testing is happening.
  - a. A little goes a long way, so there is no need to have the baking soda be more than half an inch thick!
2. One drop at a time, make a pattern with the food coloring.
  - a. This can be done in a typical rainbow pattern, in the middle of shapes designed, randomly, etc. Wherever the food coloring is placed, this will cause the fizzing rainbow there!
    - i. The colors can be stirred with a toothpick or spread out if desired
3. Before dropping the vinegar onto the plate, ask the student what they think will occur when the vinegar interacts with the baking soda and why. Complete the experiment and come back to this answer to see if their thinking has changed!
4. Using the pipette, drop the vinegar onto the plate. This can be done in any way!
  - a. One color at a time, one shape at a time, one side of the plate, etc. There is no wrong way to do this!
    - i. As long as the vinegar isn't *poured* onto the plate, the reaction will happen correctly.
5. Repeat until all the baking soda is fizzing.
6. Observe what happens and discuss! Relevant background knowledge and discussion questions are below.

## Discussion Guide/Extension

### Background Knowledge

- The interaction between the baking soda and the vinegar is showing an acid-base reaction.
  - Baking soda is the base, and vinegar is the acid
    - A base is a substance with a pH level of 8-14
    - An acid is a substance with a pH level of 1-6
    - A substance with a pH of 7 is considered to be a neutral substance
      - Example: water
- When the acid and the base interact with each other it releases a gas as a product. This gas is seen as the fizzing bubbles on the colorful plate.
- The vinegar that is left on the plate neutralizes with the leftover baking soda to produce the 'picture' that is seen.
  - The color does not add anything to the experiment except to help with a visual of the reaction
- A neutralization reaction is what occurs when an acid and a base interact to form salt and water. This is formed out of equal weights of the acid and the base out of their H<sup>+</sup> (hydrogen) ions and OH<sup>-</sup> (hydroxide) ions.
- An ion is an atom/group of atoms that carries a positive or negative electric charge. This happens when their electrons are lost or gained in a reaction.
- A positively charged ion (H<sup>+</sup>) means electrons have been lost. This is referred to as a cation.
- A negatively charged ion (OH<sup>-</sup>) means electrons have been gained. This is referred to as an anion.

### Discussion Questions

- Return to the initial question posed to the student. How has their thinking changed? Why did their thoughts about the interaction between the vinegar and baking soda change?
- Why did bubbles form when the vinegar and baking soda interacted?
  - What was released from these bubbles?
- Why did no reaction occur when the food coloring was added? Why no bubbles then?
- What caused the colors to spread out and blur together?
- What type of reaction does this activity show?
- What is an acid? A base?
  - What is an acidic pH? A basic pH? A neutral pH?
- Why would this interaction not take place if baking soda and water were combined?
- The leftover material on the plate has been neutralized. What does that mean? What do you think the pH would be of the material on the plate?
- What is the purpose of ions? Why are they important in this reaction and in everyday life?