

## Why do baking soda and vinegar react to each other?

### Answer 1:

Baking soda and vinegar react with each other because of an acid-base reaction. Baking soda is a bicarbonate ( $\text{NaHCO}_3$ ) and vinegar is an acetic acid ( $\text{HCH}_3\text{COO}$ ). One of the products this reaction creates is carbon dioxide.

You can make your own vinegar and baking soda bottle rocket! Take a piece of paper and put some baking soda on it. Wrap it up like a burrito and roll the ends tight. Pour some vinegar into an empty bottle. Put your baking soda paper roll in the bottle, cork the bottle, shake it up and quickly place it on the ground. See how high your rocket will go!



### Answer 2:

Baking soda and vinegar react with each other because they exchange atoms. In this case, they exchange a proton, which is a subatomic particle that makes atoms. You can also think of a proton as a Hydrogen atom that is missing an electron. In this reaction, baking soda acts as a base, and takes a proton from vinegar, which is an acid. The reaction releases gas because when the baking soda receives the proton, it transforms into water and carbon dioxide.

### Answer 3:

Baking soda is sodium bicarbonate: each molecule of baking soda contains a sodium atom, a hydrogen atom, an oxygen atom, and a carbon dioxide molecule.

Vinegar contains acetic acid, each molecule of which contains a hydrogen atom, and an acetate ion.

When combined, the hydrogen atom in the acetic acid meets up with the hydrogen and oxygen atoms in the baking soda to form a molecule of water, while the acetate ion grabs onto the sodium atom and forms a salt, sodium acetate. The carbon dioxide molecule, free of its other chemical bonds, can now escape, and bubbles forth as a gas.

#### Answer 4:

They react because baking soda is a base and vinegar is an acid dissolved in water. When you mix an acid and a base in a solvent, which in this case is the water, usually the acid transfers hydrogen to the base to form a new compound. In this case, the new compound is called carbonic acid, which then decomposes to water and carbon dioxide gas. (A more precise definition of acids and bases states that a base is a compound that wants to donate electrons, and an acid is a compound that wants to accept electrons.) For more information on the chemical reaction, check out

[please click here to for more information](#)

#### Answer 5:

Baking soda and vinegar react with one another because they both have a lot of energy that they don't want and they can help each other get rid of it! You might think this explanation is too simple, but it's true to what's happening.

Before we go into more detail, let's be clear about our materials. The chemical name for baking soda is sodium bicarbonate. Its chemical formula is  $\text{NaHCO}_3$ , meaning it's made of one sodium atom, one hydrogen atom, one carbon atom, and three oxygen atoms. Vinegar is a mixture of acetic acid and water. Dilute acetic acid is the chemical name for vinegar, and its chemical formula is  $\text{CH}_3\text{COOH}$ . From here on out I will write the chemical formulas in parentheses.

Baking soda is a base, and vinegar is an acid. An acid is a chemical that wants to get rid of a proton, or a positively charged hydrogen atom. A base is a chemical that wants a proton. When you mix an acid with a base exciting things can happen because the acid is ready to give away its proton and the base is right there to receive it!

Water is often added to acids and bases to tone down the intensity of this exchange. Water also acts as host in which the acid and base can break apart and react. In water, baking soda breaks apart into a positively-charged sodium ion ( $\text{Na}^+$ ) and a negatively charged bicarbonate ion ( $\text{HCO}_3^-$ ). An ion is a charged atom or molecule. Acetic acid doesn't break apart on its own in water as much as sodium bicarbonate; it's mostly diluted so it's not as strong.

When we mix baking soda and acetic acid in water together, acetic acid gives its proton to the broken-apart baking soda and together they form sodium acetate ( $\text{CH}_3\text{COONa}$ ), water ( $\text{H}_2\text{O}$ ), and carbon dioxide ( $\text{CO}_2$ ). These products are created quickly, and the carbon dioxide comes out as a gas, so the whole event is spectacular as you've seen!

By reacting with each other, the acidic acetic acid and the basic sodium bicarbonate give up a lot of their energy and create things that have a lower energy relative to each other. The universe favors things at their lowest energy, and so we see a lot of exciting reactions involving acids and bases.

Keep questioning!

**article from UCSB Science Line**

<http://scienceline.ucsb.edu/getkey.php?key=4147>

## Vinegar and Baking Soda Reaction

from Instructables: <http://www.instructables.com/id/The-vinegar-and-baking-soda-reaction-in-different-/>

(visit the site to see images)

This is what happens when the two substances mix:

The experiment baking soda and vinegar is deceptively simple: what appears to be one reaction is actually two, happening in quick succession. This reaction is an example of a multi-step reaction.

What actually happens is this: the acetic acid (that's what makes vinegar sour) reacts with sodium bicarbonate (a compound that's in baking soda) to form carbonic acid. It's really a double replacement reaction. Carbonic acid is unstable, and it immediately falls apart into carbon dioxide and water (it's a decomposition reaction). The bubbles you see from the reaction come from the carbon dioxide escaping the solution that is left. Carbon dioxide is heavier than air, so, it flows almost like water when it overflows the container. It is a gas that you exhale (though in small amounts), because it is a product of the reactions that keep your body going.

What's left is a dilute solution of sodium acetate in water.