CHEMISTRY
ROCKET:
ACID-BASE
REACTION

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Step-by-Step Photo Sequence
CHEMISTRY ROCKET: ACID-BASE REACTION

Blast-off with this new spin on the classic baking soda and vinegar experiment

Materials
- 16 oz. bottle
- Rubber stopper (needs to fit in opening of bottle)
- Tablespoon
- Baking soda
- Strong tape
- Scissors
- Three unused pencils
- Funnel
- White vinegar
- Paper towel

EXPERIMENT
1. Using the scissors, (you've got to protect those pearly whites) cut a 12" piece of strong tape. Duct tape is going to work the best, but you can substitute electrical or masking tape.
2. Use the tape that you just cut to fix the three pencils to the outside of a 16 oz. bottle. Try to keep the pencils as equidistant from each other as possible. Your Chemistry Rocket needs to have a steady launch platform.
3. Use a funnel to fill the 16 oz. bottle half full (or half-empty if your a pessimist) with white vinegar.
4. Take a single paper towel from a roll. The paper towel you have is probably comprised of multiple layers, so separate the paper towel until it is down to a single layer.
5. Tear off about 1/4 of the paper towel and put one tablespoon of baking soda on the piece of paper towel.
6. Wrap the baking soda in the piece of paper towel. Make sure that the paper towel can fit into the opening of the 16 oz. bottle.

Now you're about to get a little (read: a lot) messy. You're going to want to take this experiment outside for the rest of the steps. Trust us. Your parents and teachers will appreciate the thoughtfulness.

7. This step has to happen quickly, or what you'll have is a failure to launch. Put the paper towel-wrapped baking soda inside the bottle and immediately put the rubber stopper into the opening of the bottle. Give the rocket a quick, hard shake and set it upright on the pencils. Stand back!
8. You didn't really have time for a countdown, did you? You can do it now if you want... or you can just yell, "Awesome!" and do the experiment again.

HOW DOES IT WORK?
What do you see when you mix baking soda with vinegar? You see a lot of bubbling. The bubbles that you see are actually bubbles of carbon dioxide gas being released through an acid and base reaction. Vinegar contains acetic acid (the reason it tastes so sour), and baking soda contains sodium bicarbonate (a base). Their reaction makes carbonic acid, an unstable acid that quickly breaks down into carbon dioxide and water. The carbon dioxide then rapidly bubbles out of the water.

When you close the 16 oz. bottle with the rubber stopper, you prevent the gases from escaping the bottle, but you are increasing the amount of gases inside the bottle by creating carbon dioxide. The introduction of carbon dioxide inside the bottle causes a rapid increase in air pressure inside the bottle. The air pressure eventually gets to the point that the rubber stopper can no longer contain the gases it holds inside the bottle and... WHOOOOOOOSH!... the stopper and the contents of the bottle rush downward.
As the contents of the bottle rush downward, the bottle itself shoots upward. How does that happen? This is a fundamental demonstration of Newton's Third Law of Motion: for every action, there is an equal and opposite reaction. The initial action is the rush of matter and force downward from the bottle's opening. The reaction is the bottle jettisoning upward.
HERE IS WHAT YOU NEED

16 OZ. BOTTLE
RUBBER STOPPER
TABLESPOON MEASURER
BAKING SODA
STRONG TAPE
SCISSORS
3 PENCILS
FUNNEL
VINEGAR
PAPER TOWEL
1. Cut 12 inches of very strong tape.

2. Tape 3 pencils to the bottle.
3. Use a funnel & pour in vinegar filling it half-way.

4. Separate the paper towel into a single layer.
5. Tear off a smaller piece of paper towel.

6. Measure out 1 tablespoon of baking soda.
7. Put the baking soda on the paper towel.

8. Wrap the baking soda in the paper towel.
PUT THE BAKING SODA INSIDE THE BOTTLE & QUICKLY PUT IN THE RUBBER STOPPER

GIVE IT A SHAKE AND STAND BACK

THIS GETS MESSY SO DO THIS PART OUTSIDE