



## *Popping Open: Mixing Bases and Acids*

### **INTRODUCTION**

Have you ever wondered what causes cake batter to rise? This experiment combines two ingredients commonly found in the kitchen - baking soda and vinegar- to demonstrate what happens.

### **WHERE'S THE SCIENCE?**

Baking soda (sodium bicarbonate) is a type of chemical known as a **base**. Bases usually feel slippery, like soap. Vinegar is a type of chemical known as an **acid**. Acids usually taste sour, like grapefruit juice. In general, acidic and basic substances react with each other, producing salt and other substances such as water and carbon dioxide.

### **MATERIALS**

- Measuring cup
- White vinegar
- Plastic bag you can seal without a zipper lock
- Paper napkin
- Tablespoon
- Baking Soda
- Twist tie
- Sink



### **PROCEDURES**

1. Call students to the carpet or group area and activate prior knowledge by asking the students if they have ever baked a cake.

Then discuss with them the procedures and processes it takes. (Hopefully they will mention the batter rises in the oven into a cake. If not, guide them).

2. Review safety procedures with students. Safety goggles should be worn when doing this investigation.
3. Introduce the two materials that the students will be working with, baking soda and vinegar. Instruct the students to observe the two materials in their separate containers. Distribute the two materials (baking soda and vinegar) in sealed clear containers to each group. Describe the properties of each material. Include the state of matter of each material. Allow students to share their observations with the class.
4. Have the students conduct their own investigations in small groups. Have each student in the small group perform the investigation individually so that the others can watch and observe what is happening. Post the following procedures in a visible place in the room and instruct the students to carry out the investigation step by step.
  - 1) Pour a half cup of vinegar and a quarter cup of warm water into the plastic bag.
  - 2) Seal the bag and make sure that it does not leak.
  - 3) Tear the paper napkin in half.
  - 4) Put two (2) tablespoons of baking soda in center of the paper napkin.
  - 5) Bring edges of the napkin together and wrap twist tie around them.
  - 6) Open the plastic bag halfway.
  - 7) Drop the napkin containing the baking soda into the bag and reseal it quickly.
  - 8) Gently shake the bag and put it in the sink.
  - 9) Stand back and watch what happens.
5. Instruct the students to record observations, questions, results, and conclusions in their science notebooks. Encourage them to sketch pictures of what is happening during the investigation.

6. Once the investigation is complete, call the groups to the carpet area. Ask students to report their finding to the class. What did they notice about the how the two substances reacted with each other? What states of matter did they observe after the reaction? Record the students' thoughts and ideas on the chart paper and any further questions.

## **EXTENSIONS**

- Have students brainstorm what could be changed from their original investigation (different sized plastic bags, different amounts of baking soda or vinegar, and different water temperatures).
- Have students choose one of the variables and investigate. They may work individually, in pairs, or in small groups of three or four.
- Be sure they record all data, findings, conclusions, and include drawings and/or photos.
- Have students report their findings to class.
- Have students find the mass of the vinegar and water mixture in the bag and the mass of the baking soda in the napkin. Record the mass of each in a table in the students' science notebook. Then after the reaction, have the students find the mass of the combined materials and reaction products. Add this mass to the table. The mass should be the same.

## **Additional Resources**

Tocci, S., *Experiments with Foods*. 2003 ISBN 0-516-22787-4

[www.funsci.com/fun3\\_en/acids/acids.htm](http://www.funsci.com/fun3_en/acids/acids.htm)

Informational site with experiments on acids and bases.

<http://scifun.chem.wisc.edu/HOMEEXPTS/ACIDBASE.html>

Informational site on acids and bases.

<http://sciencespot.net/Pages/kdzchem3.html>

Informational site about acids and bases for students to explore.

## **Vocabulary**

**Acid:** a chemical that gives off hydrogen ions when it is dissolved in water. Acids have a pH below 7.

**Base:** a compound that forms hydroxyl ions (OH) when dissolved in water. Bases turn red litmus paper blue and have a pH greater than 7. Their solutions have a bitter taste.

## **Nevada State Science Standards**

P5A3 Students know materials can be classified by their observable physical and chemical properties (e.g. magnetism, conductivity, density, and solubility). E/S

P5A4 Students know that by combining two or more materials, the properties of that material can be different from the original materials. E/S

P5A5 Students know the mass of a material remains constant whether it is together, in parts, or in a different state. E/S

N5A1 Students know scientific progress is made by conducting careful investigations, recording data, and communicating the results in an accurate method. E/S

N5B3 Students know the benefits of working with a team and sharing findings. E/L

## **Safety Reminder**

Students must wear goggles during this investigation.

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