



Baking Soda Bubbles

Amount of time Demo takes: 2-3 minutes

Try this at home!

Lesson's Big Idea

- The mixture of vinegar and baking soda will undergo a chemical reaction causing bubbling, making carbon dioxide (CO_2).
- The carbon dioxide stays at the bottom of the fish tank because it is more dense than the air in the fish tank.
- Later on, when we blow bubbles, they will float on top of the carbon dioxide because they are filled with air, which is less dense than the carbon dioxide at the bottom of the fish tank.

Materials

- 1/2 cup of baking soda (1/2 cup per demo)
- 2 cups of vinegar (2 cups per demo)
- Bubble solution and a bubble wand (1)
- Fish tank
- Small clear cup (1)
- Spoon (1)
- Bucket for liquid waste

SAFETY!

- Vinegar contains acetic acid, avoid contact with eyes
- Flush eyes for 5-10 minutes if vinegar comes into contact with eyes

Background Information

- The density of carbon dioxide is 1.98kg/m^3
- The density of air (which is mostly made up of nitrogen and oxygen) is 1.225 kg/m^3
- Density is the amount of mass a substance has per unit volume.
- Pretend you have 2 balloons and one was filled with air and one filled with carbon dioxide. If both were filled to the same size (volume), the balloon filled with carbon dioxide would weigh more.

Setup Instructions

1. Put ½ cup baking soda in the fish tank.
2. Then add 2 cups of vinegar.
3. Wait for the baking soda and vinegar chemical reaction to stop (when bubbles stop forming).

Instructional Procedure

1. Use the bubbles/bubble wand provided to blow bubbles into the fish tank.
2. Observe how the bubbles will float in the fish tank, sitting where the air and carbon dioxide meet.

Tips & Tricks

- If not enough vinegar or baking soda is used then there may be issues with filling the tank with enough carbon dioxide.
- When the mixture of baking soda and vinegar has stopped bubbling the chemical reaction has stopped. This provides the maximum amount of carbon dioxide from the reaction.

Assessment Questions

- What happens when you mix baking soda and vinegar?
 - It undergoes a chemical reaction:
$$\text{C}_2\text{H}_4\text{O}_2 + \text{NaHCO}_3 \rightarrow \text{NaC}_2\text{H}_3\text{O}_2 + \text{H}_2\text{O} + \text{CO}_2$$

VinegarBaking Sodasodium acetatewatercarbon dioxide gas
- What does the chemical reaction produce?
 - Carbon dioxide and water
- Why do the bubbles float?
 - Because the air (which is mostly nitrogen and oxygen) inside is less dense than the carbon dioxide.

Careers & Real-World Applications

- Chemical Engineer - Dealing with a chemical reaction process and varying densities is common in chemical engineering.
- Chemist - A chemist works with chemical reactions on a regular basis to provide a solution for problems they are faced with.
- Environmental Engineer - could work on atmospheric research, global

warming, and the effects of increased CO₂ in the atmosphere.

Clean Up

- Clean up any mess created between demos if needed.
- When completely finished gather all materials listed for this demo and make sure everything is accounted for. If something was used up, broken, or damaged, let someone know so it can get replaced or fixed.
- Thoroughly wash and dry the fish tank, cup, spoon, and waste bucket.

References

- <http://www.elmhurst.edu/~chm/vchembook/123Adensitygas.html>

Related Next Generation Science Standards

- K-5
 - 2-PS1 Matter and Its Interactions
 - 5-PS1 Matter and Its Interactions
- 6-8
 - MS-PS1 Matter and Its Interactions
- 9-12
 - HS-PS1 Matter and Its Interactions