

THE EFFECT OF CO₂ IN LUNGS ON A CHEMICAL INDICATOR

Developed by Linda Roberts
Grades 3-7



Objectives

Students will...

- Explore the function of the respiratory system.
- Gain concept of the respiratory process.
- Be able to explain how gases are exchanged between the lungs and the blood stream.

Materials

- Household Ammonia (a few drops)
- Bromothymol Blue (BTB) pH Indicator
- Flask (or clear soda bottle)
- 2-Hole Rubber Stopper to fit flask (or bottle)
- Plastic Transfer Pipette
- Plastic Drinking Straws
- Masking Tape
- Wide Range pH Paper
- Safety Glasses
- Safe Test Tubes (or clear 20-oz. soda bottles)
- Clear Soda

Discussion

Q: What caused the BTB to change colors?

A: The CO₂ in your breath combined with the water producing carbonic acid.

Q: What could you do to increase the amount of carbon dioxide in your lungs?

A: Hold your breath first, exercise to raise breathing rate.

Q: What gives soda some of its tangy taste?

A: CO₂ / Carbonation

Group Demonstration

Add a small amount of Bromothymol blue (BTB) indicator to a flask filled with water. Check the pH of the solution to make sure it is neutral. If the solution is slightly acidic, add ammonia, one drop at a time to make sure it is neutral. Do not add too much ammonia or the color of the indicator won't change when students breathe into it. BTB is blue when neutral, green when slightly acidic, and yellow when more acidic.

Cut the stem off of a plastic transfer pipette. Insert the stem into the 2-hole stopper. If it doesn't fit tightly, wrap a small amount of masking tape around the stem. Put one drinking straw in the bottom of the pipette stem so it will reach the bottom of the flask. Cut other plastic straws into 2" pieces. Each student will use a clean piece of straw placed on top of the pipette stem as a mouthpiece to be sanitary.

Call students to come up one at a time, wearing safety glasses. Insert the mouthpiece over the pipette stem and blow gently into the flask. (Warn students not to inhale through the straw and that they should stop before they become dizzy.)

After a few minutes, you should start to see the BTB change from blue to green, indicating the presence of weak acid. Check the pH of the solution and compare it to the previous pH check.

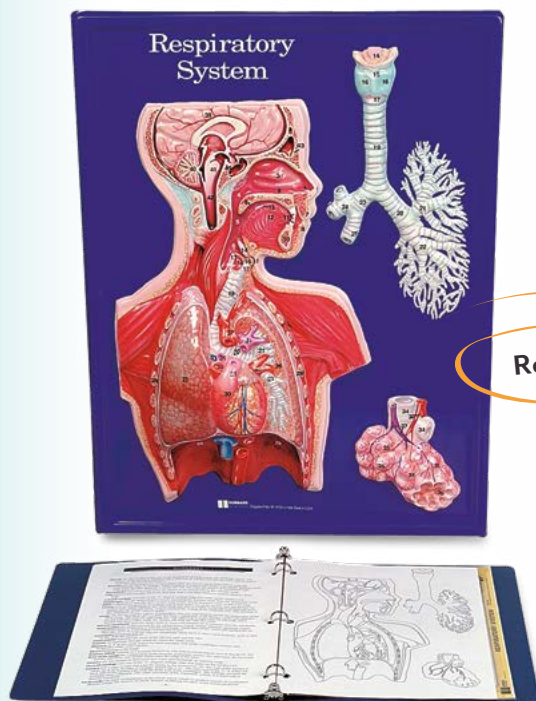
Individual Demonstration

Wear safety glasses. Do not inhale liquid through the straw. Use safe test tubes or 20-oz. clear soda bottles. Add the pipette stem to a 2-hole stopper that will fit the mouth of the tube or bottle. Put a longer piece of straw on the bottom of the stem to reach the bottom of the tube or bottle. Add the BTB solution. Check the pH of the BTB solution. Use a straw mouthpiece to blow gently into the tube or bottle. Observe the color change. Measure the pH of the solution after the color changes.

Extension

In addition to the demonstration, add a small amount of clear soda to another flask containing BTB. You should see the same color change. Check the pH of the soda.

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