

ESD KIT: IMPACTS OF CLIMATE CHANGE



Sustainable Development Goal 13: Climate Action

Investigation 3A: MEASURING CARBON DIOXIDE AND ACIDITY

Learning Outcome: Conduct tests to determine the effects of carbon dioxide on the pH of water and effects of acids on other materials.

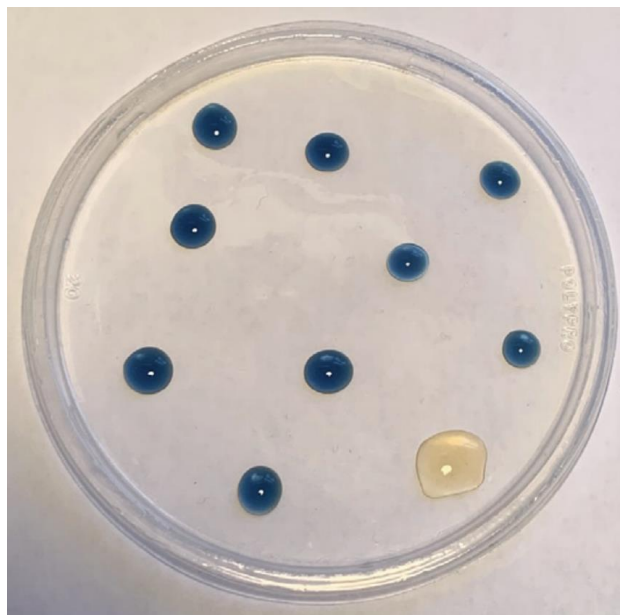
Materials

- 2 small cups
- water
- small cup of apple cider or white vinegar
- pH paper
- petri dish or similar
- 2 pipettes
- toothpick
- bromothymol blue
- device with stopwatch and camera

What to Do

1. Use a small strip of pH paper to measure the pH of the vinegar. Use another strip to measure the pH of the water.
2. Add enough water to a small cup to fill a pipette (approximately 3 mL). Add 8–10 drops of bromothymol blue until the solution is an even blue color. Fill a pipette with this solution.
3. Use the pipette full of solution to make 6–10 drops in different areas of a petri dish. Each drop should contain 2–3 droplets of solution.

- a. Record the initial color of the drops.
 - b. Compare this to the color chart that comes with the indicator. What is the pH of the drops?
4. Use a new pipette to add 5 drops of vinegar to the petri dish. Add the vinegar along the side of the dish or in another spot where it will not come into contact with the water drops.



Credit: L.C. Mossa

5. Cover the dish. Wait one minute to observe the color of each water drop. Record the color every minute for 15 minutes.
 - a. Be careful not to bump or move the dish.
 - b. If possible, take pictures of the color changes.
6. After 15 minutes of observation, add three drops of bromothymol blue to the vinegar spot in the petri dish to test its pH.

Consider

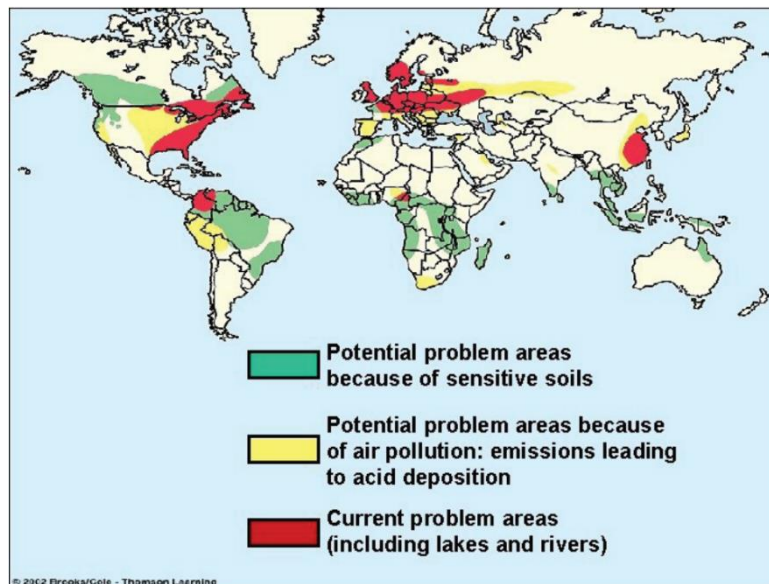
1. Compare the rate of color change in the different drops of water.
2. Describe how you think the water became more acidic (a lower pH) over time. Remember, the vinegar never touched the water drops.
3. When carbon dioxide mixes with water, it produces carbonic acid. Describe how an increase in atmospheric carbon dioxide can lead to acid rain.

Extension – Analyzing Data

Examine the map “Potential Effects of Acid Rain”. The yellow areas on the map are where emissions that can lead to acid rain are occurring. The red areas are the regions where acid rain is already causing problems in the environment.

1. Describe the patterns with the yellow and red areas on the map.
2. Why do you think the areas that produce emissions that cause acid rain are not the same areas that get acid rain?
3. Are there any locations on the map that don't follow the pattern(s)? Why do you think that is?

Potential Effects of Acid Rain



Credit: Brooks and Cole, Thomson Learning