



# Does Your Town Have Acid Rain?

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## Topic

Measuring the acidity of precipitation



## Time

30 minutes to 1 hour to test each sample collected (collection time will vary)



## Safety

Please click on the safety icon to view the safety precautions. pH buffers are toxic. Keep them away from mouth, skin, and clothes.

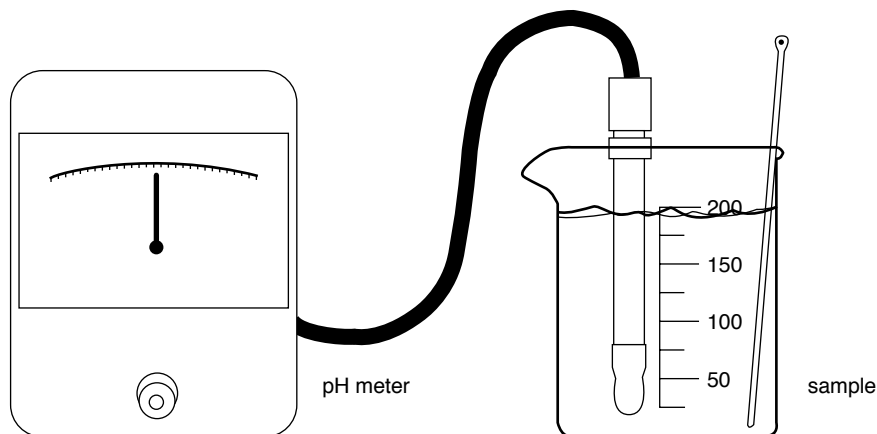
## Materials

pH meter  
pH buffers for pH 4, pH 7, and pH 10  
collection container (glass, ceramic, or plastic)

Celsius thermometer  
25-mL beaker

## Procedure

1. Place a glass, ceramic, or plastic container outside the next time it rains or snows. Be sure the container is not next to a building (runoff water from the roof will not give you an accurate measurement of acid rain). Also, place the container on high ground so that you do not collect runoff contaminated by soil.
2. Bring the sample to a temperature of 20°C. Adjust the pH meter for this temperature (see the illustration). Also, adjust the meter for correct readings by using buffers for pH 4, pH 7, and pH 10. Consult your teacher or a science text to find out how to do this.



3. Leave the pH meter probe in the sample for at least 15 min before taking a reading. Record your reading and the date it was taken.
4. Continue collecting and testing samples for a month. Average the findings of your tests.
5. What pH readings did you find? Did the readings change over the month you took them?
6. Any area with pH readings from 3.6 to 4.8 has serious problems with acid rain. Readings from 4.8 to 5.6 indicate moderate problems. Readings of 5.6 to 6.9 indicate little danger. Based on your findings, evaluate the seriousness of the acid rain problem in your area.

### What's Going On

Changes in temperature and salinity cause water to move. In many parts of the United States and Canada, water supplies and forests have been affected by acid rain—rain that contains chemical pollutants generated by heavy industry. In this experiment, you tested the rainfall in your area to see if it had this problem.

### Connections

Acid rain can damage monuments and buildings, which are usually made up of limestone. Acid rain can also affect metal surfaces. In 1980, the United States and Canada signed the Memorandum of Intent on Transboundary Air Pollution. This initiated the formation of scientific study groups in the United States and Canada to research the effects of pollution on the environment. In 1991, President Bush and Prime Minister Mulroney signed an agreement that involves the cooperation of both countries to reduce transboundary air pollution.

# Safety Precautions

READ AND COPY BEFORE STARTING ANY EXPERIMENT

Experimental science can be dangerous. Events can happen very quickly while you are performing an experiment. Things can spill, break, even catch fire. Basic safety procedures help prevent serious accidents. Be sure to follow additional safety precautions and adult supervision requirements for each experiment. If you are working in a lab or in the field, do not work alone.

This book assumes that you will read the safety precautions that follow, as well as those at the start of each experiment you perform, and that you will *remember* them. These precautions will not always be repeated in the instructions for the procedures. It is up to you to use good judgment and pay attention when performing potentially dangerous procedures. Just because the book does not always say “be careful with hot liquids” or “don’t cut yourself with the knife” does not mean that you should be careless when simmering water or stripping an electrical wire. It *does* mean that when you see a special note to be careful, it is extremely important that you pay attention to it. If you ever have a question about whether a procedure or material is dangerous, stop to find out for sure that it is safe before continuing the experiment. To avoid accidents, always pay close attention to your work, take your time, and practice the general safety procedures listed below.

## PREPARE

- Clear all surfaces before beginning work.
- Read through the whole experiment before you start.
- Identify hazardous procedures and anticipate dangers.

## PROTECT YOURSELF

- Follow all directions step by step; do only one procedure at a time.
- Locate exits, fire blanket and extinguisher, master gas and electricity shut-offs, eyewash, and first-aid kit.
- Make sure that there is adequate ventilation.
- Do not horseplay.
- Wear an apron and goggles.
- Do not wear contact lenses, open shoes, and loose clothing; do not wear your hair loose.
- Keep floor and work space neat, clean, and dry.
- Clean up spills immediately.
- Never eat, drink, or smoke in the laboratory or near the work space.
- Do not taste any substances tested unless expressly permitted to do so by a science teacher in charge.

## USE EQUIPMENT WITH CARE

- Set up apparatus far from the edge of the desk.
- Use knives and other sharp or pointed instruments with caution; always cut away from yourself and others.
- Pull plugs, not cords, when inserting and removing electrical plugs.
- Don’t use your mouth to pipette; use a suction bulb.
- Clean glassware before and after use.
- Check glassware for scratches, cracks, and sharp edges.
- Clean up broken glassware immediately.

- Do not use reflected sunlight to illuminate your microscope.
- Do not touch metal conductors.
- Use only low-voltage and low-current materials.
- Be careful when using stepstools, chairs, and ladders.

**USING CHEMICALS**

- Never taste or inhale chemicals.
- Label all bottles and apparatus containing chemicals.
- Read all labels carefully.
- Avoid chemical contact with skin and eyes (wear goggles, apron, and gloves).
- Do not touch chemical solutions.
- Wash hands before and after using solutions.
- Wipe up spills thoroughly.

**HEATING INSTRUCTIONS**

- Use goggles, apron, and gloves when boiling liquids.
- Keep your face away from test tubes and beakers.
- Never leave heating apparatus unattended.
- Use safety tongs and heat-resistant mittens.
- Turn off hot plates, bunsen burners, and gas when you are done.
- Keep flammable substances away from heat.
- Have a fire extinguisher on hand.

**WORKING WITH MICROORGANISMS**

- Assume that all microorganisms are infectious; handle them with care.
- Sterilize all equipment being used to handle microorganisms.

**GOING ON FIELD TRIPS**

- Do not go on a field trip by yourself.
- Tell a responsible adult where you are going, and maintain that route.
- Know the area and its potential hazards, such as poisonous plants, deep water, and rapids.
- Dress for terrain and weather conditions (prepare for exposure to sun as well as to cold).
- Bring along a first-aid kit.
- Do not drink water or eat plants found in the wild.
- Use the buddy system; do not experiment outdoors alone.

**FINISHING UP**

- Thoroughly clean your work area and glassware.
- Be careful not to return chemicals or contaminated reagents to the wrong containers.
- Don't dispose of materials in the sink unless instructed to do so.
- Wash your hands thoroughly.
- Clean up all residue, and containerize it for proper disposal.
- Dispose of all chemicals according to local, state, and federal laws.

BE SAFETY-CONSCIOUS AT ALL TIMES