

Acid Rain



Session 1

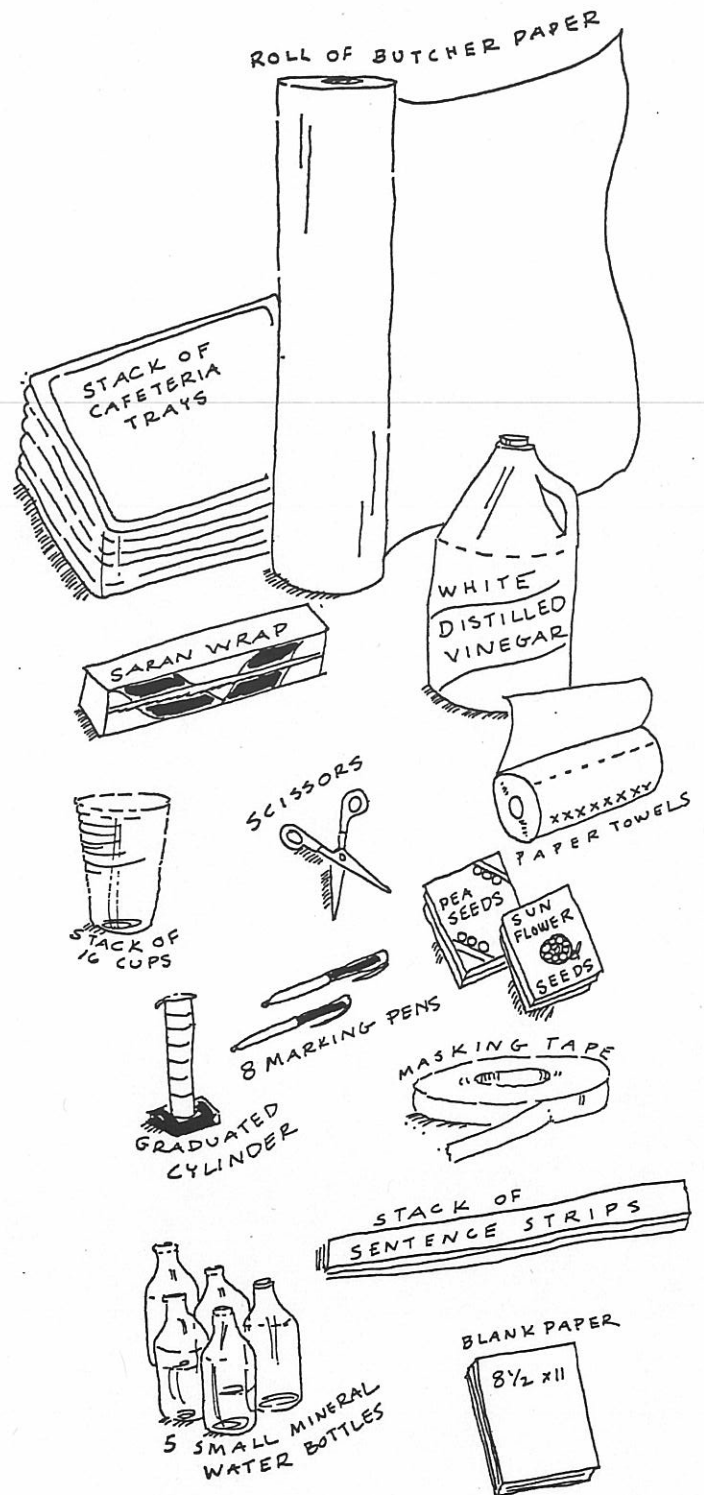
What You Need

For the class:

- 30 or 40 sheets of blank paper (at least one for each student, with several to spare)
- 1 graduated cylinder
- 5 empty, clean 8–10 oz glass bottles (such as those used to contain mineral water)
- four or five large sheets of butcher paper
- a marking pen
- masking tape
- scissors
- about 150 milliliters of white distilled vinegar
- about 300 milliliters of tap water
- access to a sink or 1 cottage cheese or other small wide-mouthed container for collecting waste solutions

For each group of 4 students:

- 1 cafeteria tray
- 2 clear plastic wide-mouthed cups (about 9 oz. capacity)
- 1 marking pen that can write on plastic cups
- 2 pieces of paper towel, large enough to fit into the bottom of the plastic cups
- 2 sheets of plastic wrap, large enough to easily cover the tops of the plastic cups
- 20 seeds (provide half the groups with sunflower seeds and the other half with pea seeds). Use seeds from packets of gardening seeds. Don't use dried seeds intended for eating, unless you find beforehand by testing them that they have high germination rates.
- 5 or more "sentence strips" (Sentence strips are commercially available. They are strips of light card stock approximately 24" long and 3" wide. See the "Resources" section on page 142 for ordering information. Or, you can make your own by cutting strips of butcher paper or newsprint. The exact size is unimportant.)



For each student:

- 1 "Acids in Your Life" homework sheet (master provided, page 19)

Session 2

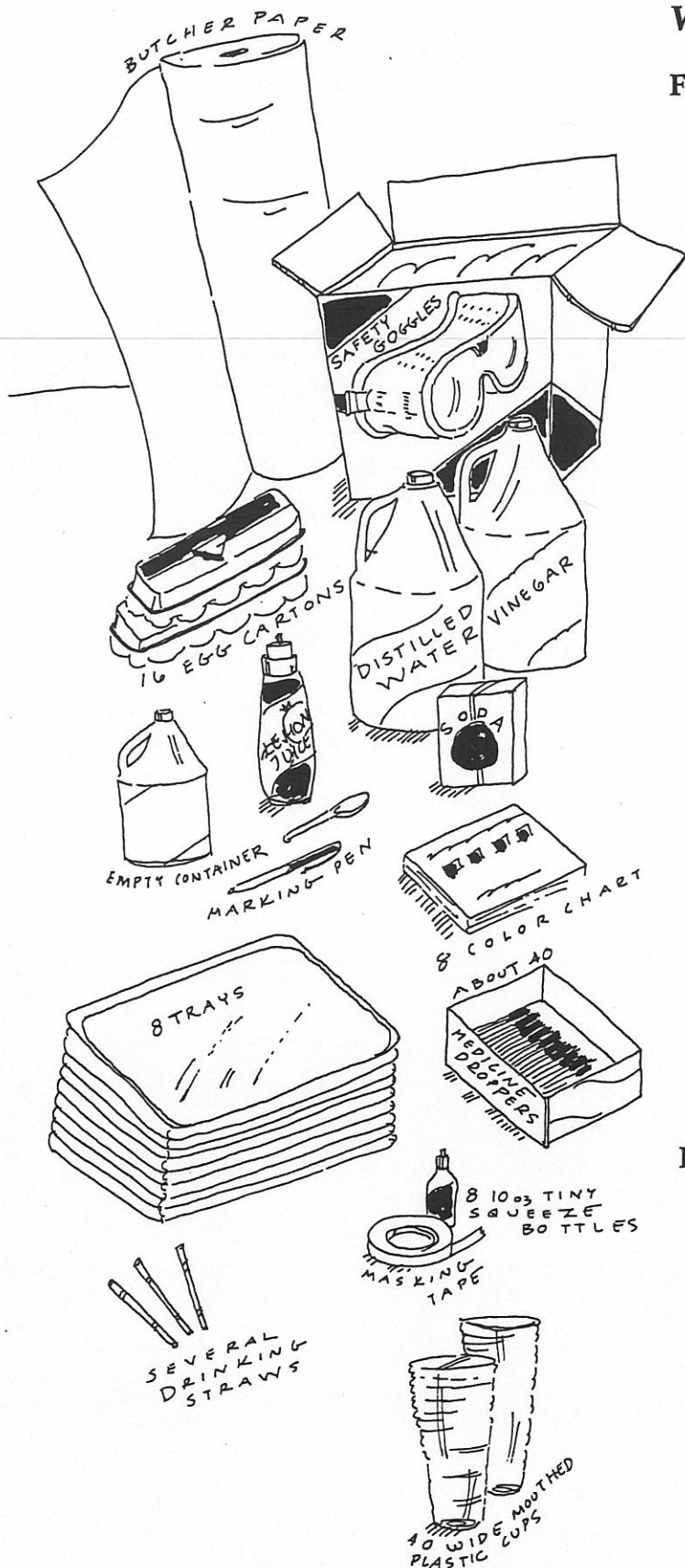
What You Need

For the class:

- 1 large sheet of butcher paper (about 5–10 feet in length)
- 1 marking pen
- masking tape
- several drinking straws
- 2 clear plastic wide-mouthed cups
- approximately 125 mls of Universal Indicator solution (available from a scientific supply company. See "Resources" on page 142 for suggestions of specific suppliers.)
- approximately 500 mls (about 16 ounces) of:
 - lemon juice
 - vinegar
- approximately 1 liter (about 32 oz) of:
 - distilled water (available for purchase at most supermarkets or drug stores)
 - tap water
- a half-liter container for making the baking soda solution
- baking soda (about 4 tablespoonfuls)
- 1 tablespoon
- access to a sink (or 2 buckets and 1 or 2 large squeeze bottles, such as empty dishwashing soap bottles, for a rinse station)
- a set of crayons or colored pencils — if you need to make Universal Indicator Color Charts. See the "Getting Ready" section for this session.)

For each group of 4 students:

- 1 cafeteria tray
- 5 clear plastic wide-mouthed cups
- 5 medicine droppers
- 1 very small squeeze bottle (30–60 ml or 1–2 oz.) to contain Universal Indicator solution
- 2 white styrofoam egg cartons (preferably with lids intact) or other reaction trays (see note in "Getting Ready" section)
- 1 Universal Indicator Color Chart (or 1 small index card so you can make one — see the "Getting Ready" section)
- 2 pH data sheets (master included, page 38)
- (optional) 4 pairs of safety goggles



Session 3

What You Need

For the class:

- about 30 meters of cotton string or acrylic yarn
- a single-hole punch
- about 20 sheets of 8½" x 11" card stock
- 8 different "Startling Statements" (masters included, pages 50–53)

For each student:

- 1 copy of the article, "Pollution, Acid Rain, and You" (master included, page 49)

Session 4

What You Need

For the class:

- 1 large sheet of butcher paper (for recording results and re-examining them in Session 5)
- 2 marking pens of different colors
- 3–4 liters of distilled water
- 1 milliliter (ml) of 1 molar (1M) sulfuric acid solution (See the "Resources" section on page 142 for information on how to purchase 1 molar sulfuric acid solution, and the "Behind the Scenes" section on page 123 for instructions on how to make a 1 molar solution from more concentrated sulfuric acid. See also page 56 for suggestions about what to do if sulfuric acid is unavailable.)
- 1 glass pipette or small graduated cylinder for measuring a 1 ml quantity of acid
- 1 two-liter container for mixing acid rain solution
- 1 pair of goggles
- several tablespoons of several different soil samples (See "Getting Ready" section for this session)
- 1 tablespoon
- approximately 10 Tums® tablets
- access to a sink (or 2 buckets, and 1 or 2 large squeeze bottles, such as empty dishwashing soap bottles, for a rinse station)

For each group of 4 students:

- 1 cafeteria tray
- 1 small squirt bottle of Universal Indicator solution (from Session 2)
- 1 Universal Indicator Color Chart (from Session 2)
- 2 medium squeeze bottles, approximately 150 to 300 ml (5–10 oz capacity)
- 1 graduated cylinder for measuring 20 ml quantities

For each student:

- 1 tall clear flexible plastic cup (9 oz. capacity)
- 1 coffee filter paper, basket-type, approximately 8 inches (20 cms) in full diameter (which the box label often describes as fitting into a basket/cup ¾ inches in diameter). Common brands such as Safeway, Melitta, or Mr. Coffee, work well.
- 1 rubber band (to secure the filter paper when it is suspended across the top of the plastic cup)
- a sheet of white paper or other white background
- 1 "Acid Rain" data sheet (master included, page 71)
- (optional) 1 pair of safety goggles

Session 5

What You Need

For the class:

- the table of class results for the "fake lakes" experiment, as recorded on butcher paper in Session 4.
- the set of demonstration "fake lakes" with the Tums® tablet added, and the set of control "fake lakes," as set up in Session 4.
- the description of an imaginary town entitled "Welcome to Laketown!" (page 83)
- 1 copy of each of the 4 group descriptions, for the student groups representing politicians, manufacturers, townspeople, and fisherpeople (masters included, pages 84–85.)

For each group of 4 students:

- access to the seed germination experiments set up in Session 1.
- a wooden popsicle stick or toothpick, to assist the students in examining the germination trials.

For each student:

- 1 copy of the article, "Efforts Continue Against Acid Rain" (master included, page 86)

Session 6

What You Need

For the class:

- 7 large index cards or half sheets of paper
- 1 large sheet of butcher paper
- 1 marker
- masking tape
- 8 copies of the script of "Acid Rain: The Play" (master included, pages 100–103).
- 4 "Possible Solutions" sheets, 1 each for the politicians, manufacturers, townspeople, fisherpeople (masters included, pages 104–105)

Session 7

What You Need

For the class:

- 4 sheets of butcher paper
- masking tape

For each group of four students:

- 5 sentence strips (see "Getting Ready," Session 1, for information on making or obtaining sentence strips)
- 1 marking pen

Session 8

What You Need

For the class:

- 10 extra sentence strips
- 1 marking pen
- "Solution Strips" generated in Session 7
- List of statements and questions begun in Session 1