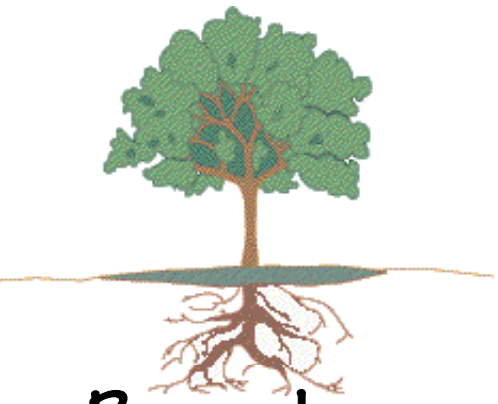
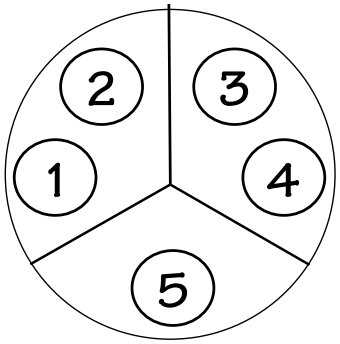


Acid Rain

Procedure:

Plastic dish



1. Always wear safety goggles.
2. Rinse the plastic dish and lid in the sink. Dry the inside of the dish with a dry rag.
3. Add 1 drop of bromothymol blue onto circles 1, 2, 3, and 4 on the plastic dish. What color is the bromothymol blue? (It should be green.)
4. Add 1 drop of hydrochloric acid (HCl) to the drop in circle 1. What happens to the color?
5. Add 1 drop of sodium sulfite (Na_2SO_3) to the bromothymol blue in circle 2. Now what happens to the color?
6. Add 2 drops of hydrochloric acid (HCl) into circle 5.
7. Please read *all* of this step before doing it! Add 2 drops of sodium sulfite (Na_2SO_3) to the acid in circle 5. Immediately cover the dish with the plastic cover.
8. Carefully observe the bromothymol blue in circles 3 and 4. (Be sure to wait until you see both circles change.) What changes do you see first?
9. Rinse the dish and lid in the sink.

When does rain hurt trees?

A Closer Look:

Bromothymol blue is a pH indicator: it shows acids and bases by changing color. When you add acid, bromothymol blue turns yellow; when you add a base (like sodium sulfite), it turns blue. Green means neutral (like water).

- When you combine sodium sulfite (Na_2SO_3) and hydrochloric acid (HCl) in step 5, they react to produce sulfur dioxide gas (SO_2). The gas mixes with the air all through the covered dish.

The sulfur dioxide gas also mixes with the water (H_2O) in the bromothymol blue drops in circles 3 and 4. It reacts to produce sulfurous acid (H_2SO_3). This acid makes the bromothymol blue turn yellow.

Sulfur dioxide gas (SO_2) is produced by industry—for example, by burning coal (which contains sulfur). In the air, this gas mixes with rainwater (H_2O) and then with oxygen (O_2) to produce sulfuric acid (H_2SO_4). This acid rain can harm plants, animals, and buildings.