Monitoring Ozone Levels

**Background**

Christian Friedrich Schoenbein discovered ozone in 1839 during his tenure as a professor at the University of Basel, Switzerland. He used the reactivity of ozone to measure its presence and demonstrate that it is a naturally occurring component of the atmosphere. He developed a way to measure ozone in the troposphere using a mixture of starch, potassium iodide, and water spread on filter paper. The paper, called Schoenbein paper, changes colour when ozone is present. Ozone causes iodide to oxidize into iodine (I2).

This test is based on the oxidation capability of ozone. Ozone in the air will oxidize the potassium iodide on the test paper to produce iodine. The iodine reacts with starch, staining the paper a shade of purple. The intensity of the purple colour depends on the amount of ozone present in the air. The darker the colour, the more ozone is present.

The reactions involved are 2KI + O3  + H2O  2KOH + O2 + I2

I2 + starch blue colour

**Procedure**

1. Place 100 ml of water in a 250ml beaker then add 5g of corn starch.
2. Heat and stir mixture until it gels. The mixture is gelled when it thickens and becomes somewhat translucent.
3. Remove the beaker from the heat and add 1g of potassium iodide and stir well. Cool the solution.
4. Cut the filter paper into 2cm wide strips.
5. Dip a strip of filter paper into the beaker and remove excess gel. Apply the paste as uniformly as possible.
6. Allow the paper to dry. Do not set in direct sunlight. A low-temperature drying oven works best.
7. Place the finished strips in a zip-lock plastic bag out of direct sunlight.

\*Wash hands thoroughly with soap and scrub under fingernails with a brush after working with the potassium iodide mixture.

Testing Procedure

1. Spray a strip of test paper with distilled water and hang it at a data collection site out of direct sunlight. Make sure the strip can hang freely.
2. Expose the paper for approximately eight hours. (Note where each strip was hung)
3. After exposure, seal the strip in an airtight container if the results will not be recorded immediately.
4. To observe and record test results, spray the paper with distilled water. Observe the colour to determine the Schoenbein Number using the Schoenbein colour scale.
5. Check the humidity to the nearest 10 percent and read off the chart.

Note: The xerographic process in most copy machines uses electrostatic charging of a cylinder. The accompanying ionization creates ozone in adjacent air, so a room containing a copy machine might be a good location to test.



