

1. **DESCRIPTION:** This event will focus on Soil Chemistry related to Environmental Chemistry.

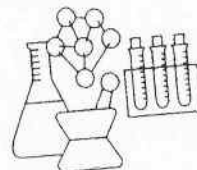
A TEAM OF UP TO: 2

EYE PROTECTION: #4

APPROXIMATE TIME: 50 minutes

2. **EVENT PARAMETERS/CONSTRUCTION:**

- Each team may bring one 8.5" x 11" two-sided page of notes containing information in any form from any source and each student may bring a pencil and a non-programmable calculator.
- Supervisors will provide:
 - Instrumentation to analyze environmental chemicals.
 - Chemicals.
 - Whatever other laboratory ware may be necessary.
 - Standardized curves to interpret the results from the analysis.
 - Event supervisors will be expected to instruct students in the use of the provided instrumentation.
- Safety Requirements:** Students must wear the following or they will not be allowed to participate: closed-toed shoes, ANSI Z87 indirect vent chemical splash goggles (see <http://soinc.org>), pants or skirts that cover the legs to the ankles, a chemical apron with a sleeved shirt or a lab coat that reaches the knees. Gloves are optional. Students who unsafely remove their safety clothing/goggles or are observed handling any of the material or equipment in a hazardous/unsafe manner (e.g., tasting or touching chemicals or flushing solids down a drain and not rinsing them into a designated waste container provided by the supervisor) will be disqualified from the event.



3. **THE COMPETITION:** This event will consist of a series of experiments and questions at stations or a single bench on these Environmental Chemistry topics:

- This year the students will be expected to use the instruments and/or chemicals the event supervisor provides to analyze soil and/or "digested" soil samples. Actual hazardous materials may not be used, but experiments to simulate the presence of hazardous materials are permitted.
- Students will be expected to analyze soils for the nutrient content and distinguish between "Absolutely necessary" (primary) compounds using NPK tests, "vital" (secondary) compounds containing Ca, Mg, and S, and "trace minerals" (micronutrients) necessary for plant growth such as Fe, Mn, Zn, B, Cu, Mo, Cl, Si, Ni, and Co.
- Students will also need to be able to distinguish between sand, silt, and clay and determine the porosity of the soil, its permeability, pH, and water retention.
- Students may be asked questions about soil pollutants, types of pollutants, to determine if a pollutant is from a point or non-point source, and possible types of remediation.
- What are the impacts of improper fertilization on the surrounding environment (including adjacent soil, water, or air)?
- What is the best course of remediation?
- Students will be expected to interpret retention times of a gas chromatograph or a mass spectrogram to analyze an organic contaminant of a soil sample.
- Students will be expected to know how to do dilution calculations, unit conversions (ppm, micro liters, etc.), and Stoichiometric calculations related to remediation.

4. **SAMPLE QUESTIONS:** Students may be given several different soil or "digested" soil samples with probes and/or chemicals and asked to determine what fertilizer/chemicals should be added to give the highest yield of various vegetables. Or students might be asked to analyze the samples for presence/absence of trace minerals or contaminants. Students may be given a mass spec or chromatogram of a pure substance and the main components of a pesticide and asked if the pesticide is present. Students may be asked to identify laboratory equipment or describe a procedure to analyze soil for a required test.

5. **SCORING:** Points will be awarded for correct answers and/or proper technique. Time may be limited at each station, but time will not be used as a tiebreaker or for scoring. All ties will be broken by a predetermined event supervisor selected question.

RECOMMENDED RESOURCE: Science Olympiad Website and CPCD at www.soinc.org