

CLEAN WATER CHALLENGE: 2008 Trial Event

1. **DESCRIPTION:** Students will design a method to alter a water sample so that it meets an Environmental Protection Agency drinking water standard(s). Students will use scientific inquiry to guide them in their design and documentation of their process.

Selected Standard: TURBIDITY

A TEAM OF UP TO: 2 **IMPOUND:** No **APPROXIMATE TIME:** 50 minutes

2. **EVENT PARAMETERS/CONSTRUCTION:**

- a. Students may bring
 - i. Writing utensil
 - ii. Optional safety items (see list below)
- b. Supervisors provide
 - i. All materials needed for the event
 - (1) Building or design items
 - (2) Water Sample
 - (3) Testing strips or equipment
 - (4) Answer/score sheets
 - (5) Writing utensils
- c. Safety items
 - i. Goggles (optional)
 - ii. Disposable gloves (optional)
- d. Parameters/guidelines for construction
 - i. Students can only use the materials provided by the supervisor. Students cannot request or use additional materials.
 - ii. Students are not restricted on how they alter the materials.
 - iii. Students are not required to use all of/every material provided.
 - iv. All design/build and testing must take place during the 30 minute design/build and test portion of the event.
 - v. Students may be limited to the number of times they test their sample. This will be outlined in the instructions given by the event supervisor or judge.
 - vi. Testing can be done at any point during the 30 minute design/build and test portion of the event.
 - vii. Judges will assist in testing the sample to assure accuracy of recorded results. Results not viewed by judges will not be scored.
- e. No impound

3. **THE COMPETITION:**

- a. How event will be administered
 - i. Students will be given a set of instructions, quiz, materials, and outline of scoring rubric at the start of the event. All instructions, questions, materials, and scoring will be the same for all teams in the competition.
 - ii. Students will have 30 minutes to design/build and test a method or process that alters the water quality to meet a specific pre-determined standard.
 - iii. Students will have 15 additional minutes to answer a set of multiple choice, fill in the blank, and true/false questions regarding water quality and the specific standard chosen for the competition. During this time any remaining written work from the previous portion of the event may be completed.

- iv. Students must hand in all leftover materials as well as copies of the instructions, questions, and scoring rubric when time expires. They also must turn in their model or device along with their written work including documentation of their process, observations, results, and answers to the quiz. Students should leave with only the items they brought, which is limited to writing utensils, and optional safety goggles and gloves.
- b. Content areas covered
 - i. Science of Inquiry
 - ii. Earth Science
 - iii. Physical Science
 - iv. Life Science
 - v. Science and Technology
 - vi. Science in Personal and Social Perspectives
 - vii. History and Nature of Science
- c. Detailed description of sequence of the event (primary construction type events).
 - i. Set up logistics
 - (1) Teams of 1-2 will be assigned to a lab table or classroom table.
 - ii. Beginning and ending of timing
 - (1) Students will have 30 minutes to complete the design/build and test portion of the event. All water sample testing must be completed during the 30 minute period. Any sample testing or model manipulation done after time has expired will not be scored.
 - (2) Students will have 15 minutes to complete the quiz and any other written work (analyzing data, interpreting results, etc). Students may begin the quiz during the design/build, and water testing portion if they choose. Any written work done after time has expired will not be scored.
 - (3) Time will begin and end at the call of the event supervisor or judge.
- d. Other competition specific instructions
 - i. Students should document their process of design, investigation, observations, data collection, results, and reflections in a written record. This record should follow steps of the scientific inquiry process.

4. **SAMPLE QUESTIONS:**

Sample instructions:

Using the materials supplied, alter the provided water sample so that the pH is at a range which falls within the US Environmental Protection Agency water standards.

Sample questions:

- The Safe Drinking Water Act gives the EPA the authority to set _____.
- Safe Drinking Water Standards regulate control the level of contaminants in the nation's _____.
- EPA delegates responsibility for implementing drinking water standard to _____ and tribes.

5. **SCORING:**

- a. 75% of the total score is based upon the team's ability to use the scientific inquiry process. (See sample scoring rubric.) 25% of the total score is based upon the quiz (multiple choice, fill in the blank, and true/false). No partial points will be awarded.
- b. No penalties
- c. No tiers
- d. Ties will be broken by 1) water sample closest to EPA drinking water standard, 2) highest score on pre-determined questions.

RECOMMENDED RESOURCES:

www.groundwater.org

www.epa.gov

www.usgs.gov

NATIONAL SCIENCE EDUCATION STANDARDS:

Content Standard A. Science as Inquiry: Abilities necessary to do scientific inquiry, Understanding about scientific inquiry

Content Standard B. Physical Science: Properties and changes of properties in matter

Content Standard D. Earth and Space Science: Structure of the Earth's System

Content Standard E. Science and Technology: Abilities of technological design, Understanding about science and technology

Content Standard F. Science in Personal and Social Perspectives: Personal health, Science and teaching society

Content Standard G. History and Nature of Science: Science as a human endeavor