Trial/Pilot Event

Contact the organizers of your tournament to find out what trial/pilot events will be held.

NUCLEAR SCIENCE LAB

DESCRIPTION: The purpose of this event is to develop an awareness of nuclear science and technology. Students will be expected to demonstrate proficiency in using radiation detection equipment. Students should have knowledge of types of radiation, shielding, measuring radioactivity, radiation terminology, nuclear decay reactions and nuclear power plants.

EVENT PARAMETERS: Students are encouraged, but not required, to bring a scientific calculator to this event. However, Graphing Calculators **will not** be allowed. **No resource material may be used unless provided by the Event Supervisor.** This event may be run at stations. Linear and logarithmic graphing paper will be provided for student use.

A TEAM OF UP TO: 2 **APPROXIMATE TIME**: 50 Minutes

THE COMPETITION: The competition will consist of two parts:

Part I: Students will complete experimental tasks and answer questions related to **nuclear instrumentation and half-life.** Students may be provided with a Geiger-Mueller tube and counter, radioactive sources, or shielding materials. All answers must be provided in the specified correct units with proper significant figures. Students will be expected to construct graphs of the data. Completeness, accuracy and quality of graphs will be taken into account. Students may be expected to complete labs concerning topics such as:

Half-Life and Decay	Background Radiation
Effectiveness of Shielding	Inverse Square Law

Part II: The second part of the competition will consist of a written test focusing on the **design and operation of nuclear power plants**. Students may be asked questions concerning the following topics:

Nuclear Reactions	Radiation Types
Nuclear Materials	Nuclear Fuel Cycle
PWR and BWR Technology	Nuclear Fission

SAMPLE PROBLEMS:

1. Sodium-24 has a half-life of approximately 15 hours. If a sample reads 40 mrem/hr at one foot today, how long in minutes must we wait for it to be at 0.05 mrem/hr at one foot?
2. If a reactor with a constant period of 30 seconds (doubling time = 20.79 secs) is at 1kW, what power level is it at one minute later (neglect any effects or reactivity feedback)?
3. Fill in the blanks for the structure of 92-U-235: A = ?, Z = ?, N = ?.
4. Reactor fuel is an alpha emitter. Based on this, how much shielding would be needed between a worker and a thinly clad rod of never burned nuclear fuel?

SCORING: Part I: 40 points, Part II: 60 points. Ties are broken by using Part II first, then Part I and if needed **pre-determined question(s)** from Part II. Time is not a tiebreaker!