Quantum Quandaries

DESCRIPTION:
Students will solve a series of problems and answer a series of conceptual questions in the area of modern physics. This event emphasizes critical thinking and content knowledge of the subject area.

EVENT PARAMETERS: Students may bring and use any type of calculator, and 2 pages of notes and formulae (Two 8½ by 11 inch sheets both front and back). Any additional reference sheets, resources, or obscure formulae needed for the test should be provided by the event coordinator.

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

THE COMPETITION: The competition will consist of a series of problems and conceptual questions in each of the following three areas of modern physics. Event Coordinators should insure that questions are asked out of all 3 areas.

At state and national levels, there will be 5-8 stations; 2-4 stations will involve laboratory tasks or demonstrations. Laboratory stations may or may not be used at regional level competitions at the tournament director's discretion. Students should receive equal time at each station.

Quantum Mechanics and Technology

Basic Principles of Quantum Mechanics, Photo Electric Effect, Spectral Lines, Semi-Conductors, Electron Microscopes

Relativity and Cosmology

Black Holes, The Big Bang, Lorentz Transformations, Twin Paradox, Gravitational lensing

Nuclear and Particle Physics

The Standard Model, Fundamental Particles, Fission, Fusion, Unified Field Theory

The test should emphasize problems and questions about the scientific content in each area and questions about landmark historical experiments and results in the development of theories in modern physics.

SCORING: Problems, questions, and lab stations will be assigned different point values based on difficulty. Points will be awarded for correct answers; partial credit should also be given on difficult problems. Illegible answers receive no points but handwriting and spelling will not otherwise be used to score or break ties. Ties will be broken first with points on designated challenge problems. At least one of the tiebreaker questions should be answered with a written essay; in the event that there are identically scored tests, the clarity and quality of the writing (language, not penmanship) should be used to break the tie.